

SCIENTIFIC AMERICAN

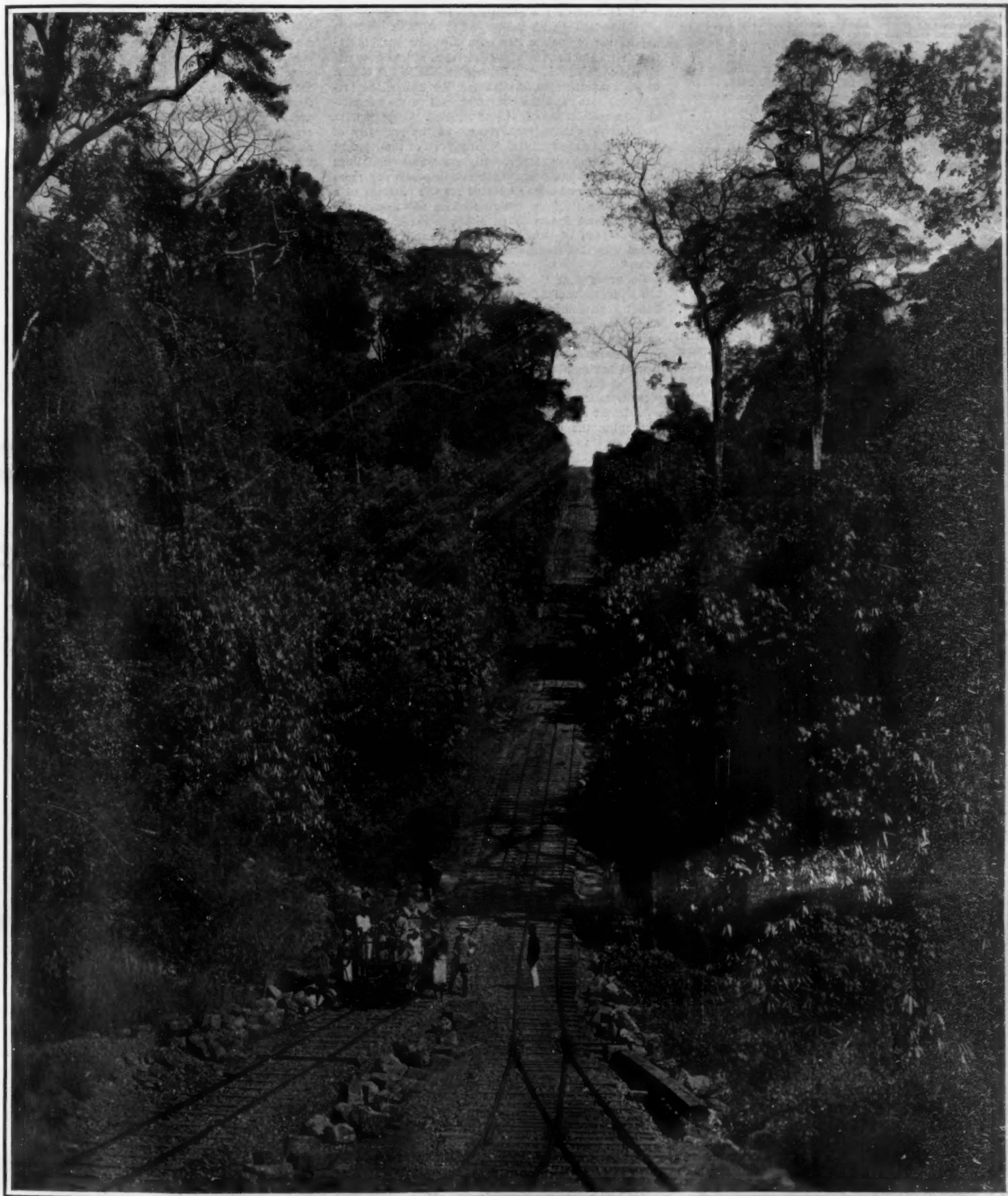
[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyright, 1910, by Munn & Co., Inc.]

A POPULAR ILLUSTRATED WEEKLY OF THE WORLD'S PROGRESS

Vol. CII.—No. 9.
ESTABLISHED 1845.

NEW YORK, FEBRUARY 26, 1910.

[10 CENTS A COPY.
\$3.00 A YEAR.]



Two-track self-acting incline on the Cochin Forest Railway. This railway opens up 500 square miles of extremely valuable hardwood timber.

A LOGGING RAILWAY THROUGH THE COCHIN JUNGLE, SOUTH INDIA.—[See page 184.]

SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN & CO., Inc., - Editors and Proprietors

Published Weekly at
No. 361 Broadway, New YorkCHARLES ALLEN MUNN, President
361 Broadway, New York
FREDERICK CONVERSE BEACH, Sec'y and Treas.
361 Broadway, New York

TERMS TO SUBSCRIBERS.

One copy, one year, for the United States or Mexico \$3.00
One copy, one year, for Canada 3.75
One copy, one year, to any foreign country, postage prepaid, lbs. ad. 4.50

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (established 1845) \$3.00 a year
Scientific American Supplement (established 1876) 5.00 "
American Homes and Gardens 3.00 "
The combined subscription rates and rates to foreign countries, including Canada, will be furnished upon application.
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., Inc., 361 Broadway, New York.

NEW YORK, SATURDAY, FEBRUARY 26th, 1910.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are sharp, the articles short, and the facts authentic, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

THE COMMISSIONER OF PATENTS' ANNUAL REPORT.

THE annual report of the Commissioner of Patents, Hon. Edward B. Moore, for the fiscal year ending June 30th, 1909, has recently been published and contains several useful suggestions for the improvement of the office of value to inventors and patentees.

Referring to the work of the office, he says:

"There were received in the last fiscal year 62,800 applications for mechanical patents, 1,186 applications for designs, 192 applications for reissues, 2,952 caveats, 7,509 applications for trade-marks, 1,001 applications for labels, and 338 applications for prints. There were 35,215 patents granted, including reissues and designs, and 4,547 trade-marks, 779 labels, and 231 prints were registered. The number of patents that expired was 22,779. The number of allowed applications, which were by operation of law forfeited for nonpayment of the final fees, was 6,763.

"The applications for patents for inventions have increased over last year by between 4,000 and 5,000 cases. The applications for trade-marks, however, show an increase of only 42. The number of trade-marks registered shows a decrease of 1,598.

"The 'act to amend and consolidate the acts respecting copyrights,' which was approved March 4th, 1909, and which became effective July 1st, 1909, repealed the act approved June 18th, 1874, under section 3 of which labels and prints have been registered in the Patent Office. Consequently no certificates of registration of labels or prints have been issued since July 1st, 1909, except those evidencing registrations effected on or before June 30th, 1909.

"The money receipts from all sources were \$1,975,919.97, and the expenditures \$1,887,443.35, leaving a net surplus of receipts over expenditures of \$88,476.62. The grand total of receipts over expenditures for maintaining the bureau from 1836 to date is now \$7,060,547. This vast sum represents the earnings of the Patent Office, and the bureau is therefore more than self-supporting."

Owing to his success in securing additional appropriations from Congress in 1908, the salaries of the examining corps were increased on July 1st of that year, resulting in a notable decrease in the annual resignations. Owing to the additional force he was authorized to employ, and the retention of the skilled examiners, the work in nearly all of the examining divisions of the office is practically current. He aims to keep the work current in all branches of the office, if possible, which is certainly a most laudable purpose, and one that should be carefully considered by Congress. He says:

"The rapid increase in the number of applications filed and the constantly increasing field of search, embracing as it does not only United States and foreign patents, but also publications of every character, make it imperative that additional force be provided each year to prevent accumulation of the work."

He has asked for one new principal examiner and twenty additional examiners to further the work of classification of patents. There are now \$30,000 United States patents, approximately half of which have been reclassified. Over 2,000,000 foreign patents and nearly 90,000 volumes of the scientific library remain to be classified.

The models formerly stored in the basement and on the first floor of the Patent Office building have been moved to another fireproof warehouse a short distance away.

Additional space for the storage of new volumes of foreign patents by at least 150 linear feet per annum should be provided for in the office library. An

appropriation of \$2,000 for this purpose, which it is thought will be sufficient for a period of five years, is recommended.

The space available for the storage of printed classified copies of patents is becoming crowded and the accommodations in the attorneys' and public search room are becoming insufficient for the work done there. One of the long hallways that has been set apart for this purpose is in a congested condition and is inadequate for the purpose. Some changes to afford temporary relief are suggested by remodeling the basement on three sides to conform to that of the Ninth Street front.

He believes that the time has arrived when measures should be taken to secure the construction of a new larger building in which ample room will be afforded to properly and promptly transact the business of the office. He says particularly:

"It is necessary that patents for new inventions should be issued with the utmost promptness after the application for patent has been filed, for such inventions form the basis of vast industries, which inure not merely to the profit of the inventor, but to the benefit of the manufacturer, the laborer, the trader, the professional man, and the consumer, and to the commercial interests of the country in general. Great Britain and Germany have each recognized the necessity of providing ample facilities for the work of their patent bureaus, and have each recently erected new buildings for their patent offices, which are in every way more commodious and better adapted for the business of a patent office than the building which now houses the United States Patent Office, although the patent business of each of those countries is small when compared with that transacted in the United States Patent Office."

He urges that the new building be located near the Congressional Library on a square north of that building as embodied in Senate bill No. 3,954, introduced by Senator Daniel, January 24th, 1898. The surplus to the credit of the Patent Office in the Treasury Department of \$7,060,547 he thinks would go far toward paying the expense of the building.

As to future desired legislation he continues his recommendation in previous reports by advocating an amendment to the statute which has for its object the shortening the course of appeals from the primary examiner (in *ex parte* cases) to the board of examiners in chief and the Commissioner by combining the board of examiners in chief with the Commissioner of Patents and his first and second assistants into a single tribunal, any three of whom shall constitute a quorum, to which all appeals shall lie, whether from a primary examiner or from the examiner in interference and from which appeals would lie to the Court of Appeals of the District of Columbia. The elimination of one appeal, he states, would materially shorten the time required for the ultimate disposal of appealed cases and effect a considerable saving of expense to applicants. We believe there is much merit in this recommendation and trust it may receive favorable consideration by Congress.

A further additional provision recommended is the amending of section 4,889 of the patent law by requiring to be filed with the drawing two photographic copies thereof with the application. One of the photographic copies is to be kept in the file wrapper and the other is to be filed in secret archives in charge of the chief draughtsman, while the drawing itself will be kept constantly in the office of the examiner and will be available at all times for inspection in their respective divisions. He states there have been cases of fraud in withdrawing and substituting other drawings for the originals and that some such plan is needed to detect possible unauthorized changes.

We think it would be more practical for the Commissioner to have the negatives made of the drawing at the time the application is filed, and withhold the delivery of the filing receipt until the official photographer had certified the photograph as being an exact reproduction of the drawing.

The Commissioner advocates the formation of a "patent bar," and suggests before an individual be permitted to practise before the Patent Office he will be required to pass an examination as to his moral, legal, and technical qualifications before a committee appointed by the Commissioner of Patents, composed of officials of the office and patent attorneys of well-known standing in the profession, who shall conduct the examination under the direction of the Commissioner. The report of the committee is to be subject to his approval. This suggestion appears to us to be very appropriate.

In regard to the amendment and improvement of treaties with other countries concerning industrial property, it is proper to say Commissioner Moore has been most successful in securing advantages for American inventors. He says on this subject:

"I am gratified to report that during the last year a treaty was negotiated with Germany, which confers great benefits upon the American inventor. The patent laws of nearly all the foreign countries contain a

clause providing that if an invention is not 'worked'—that is, manufactured or practised—in such country within a certain period, ranging from two to four years, the patent may be annulled. This treaty with Germany provides that the working of a patent in one of the contracting countries will have the same force and effect, so far as avoiding the revocation of the patent is concerned, as if it had been worked in the country in which the patent was granted. This treaty has practically assured to American inventors the protection of their rights in Germany during the full period for which the German patent is issued, contingent only on the working of the invention in one of the two countries.

"It is understood that Sweden has modified its laws to extend similar protection to other countries which do not require the working of the invention within a specified period, and negotiations are now pending with nearly all the European states for the promulgation of treaties of the same character. In order to assist in the negotiations of these treaties, I have been delegated by the Department of State, and with your permission I shall visit the capitals of several foreign nations to assist, so far as within my power, in the negotiations of such treaties, which if concluded will greatly extend the protection of inventors, manufacturers, and the industrial interests of this country, as well as those of the nations with whom such arrangements may be made."

He states the next International Convention for the Protection of Industrial Property is to be held at Washington, D. C., in May, 1911. About this he is most sanguine and enthusiastic. He says:

"The meeting of this convention is most important to the interests of the American inventors and manufacturers. The 21 nations which are adherents to this union will be represented by delegates having full power to negotiate agreements in respect to the reciprocal protection of patents, designs, trade-marks, and industrial models, which when ratified by their respective governments will have the force of treaties. The efforts of these conventions in the past have been crowned with success, the agreements relating to the reciprocal protection of patents and trade-marks having been ratified by all adherents, which comprise the leading commercial nations of the world, and the Congress of the United States has in each instance amended the patent laws of this country to accord with the terms of the international agreements concluded at these conventions.

"Not only are the members of the union represented by delegates, but all other civilized nations, not members of the union, are invited to send representatives in the interest of furthering the reciprocal protection of industrial property. It is expected that at this coming convention a strong effort will be made to harmonize the laws relating to patents and trade-marks throughout all countries in such a manner that adequate protection will be given to an inventor, no matter of what country he may be a citizen, without the necessity of obtaining expensive patents in each of the several countries in which his invention may be used or sold. It is also proposed to perfect and extend the international registration of trade-marks and thus further the reciprocal protection of commercial industries."

THE ALL-STEEL CAR THE CAR OF THE FUTURE.

FOR many years past the SCIENTIFIC AMERICAN has strongly advocated, on grounds of public health and safety, the building of all-steel cars for railroad service; and we are therefore much gratified to learn that the Pennsylvania Railroad Company is adding to its steel-car equipment at a rate which promises, before many years, to eliminate the present wooden car, and provide that great system with an all-steel passenger car equipment. It was on August 12th, 1906, that that railroad announced that all future passenger equipment would be built of steel and that the design would be such as to render it indestructible either by collision or fire. In planning the cars and establishing those standard types which are now being copied in all the new equipment, no expense has been spared to build a coach which should provide the greatest possible strength, and finish it with an inside lining that should be absolutely unburnable and possess the added and not inconsiderable advantage that it would be a poor conductor of heat and noise. The first order, placed in November, 1906, was for 100 cars. Subsequent orders have been given, and there are now in service 245 coaches, 10 dining cars, 21 combination passenger and baggage cars, 29 baggage cars, 18 postal cars, and 1 company car, making a total of 324 steel cars. Furthermore, the Pullman Company has been building for the railroad during the past four years some all-steel parlor and sleeping cars. About 500 of these will shortly be placed in service. With the present steel equipment and some 250 cars to be ordered during the present year, the Pennsylvania railroad will in a short while have in service 900 of its own steel passenger cars and about 500 steel Pullman cars.

ENGINEERING.

In a paper recently read by Mr. Henry Hess before the American Society of Mechanical Engineers on the power lost in belting, it was shown that 90 per cent of the power transmission lost was due to journal friction. This may be materially reduced by substitution of ball for plain bearings, provided care be taken to suit the size of the balls to the load.

The Committee of the American Railway Maintenance-of-Way Association in a recent bulletin takes up the subject of rail specifications. For Bessemer rails of 85 to 100 lbs. it recommends the following composition: Carbon, 0.45 to 0.55; manganese, 0.85 to 1.15; phosphorus not to exceed 0.10; and sulphur not to exceed 0.075. The recommendations for open-hearth steel for the same weight of rail: carbon, 0.63 to 0.76; manganese, 0.75 to 1.00; phosphorus not to exceed 0.04, and sulphur not to exceed 0.06.

The two latest German dreadnoughts are to be equipped with turbines; and special interest attaches to the fact that two rival types of turbine, the Parsons and the Curtis, will be tried out against each other. The "Heimdal" will be propelled by triple screws operated by Curtis turbines, and the sister ship will be equipped with Parsons turbines of equal contract power.

A method of simultaneously excavating and lining vertical shafts is contemplated in one of the contracts for the Catskill water supply. In the shaft will be suspended a lining platform, from which the concrete forms will be erected and concrete laid. The excavating will be carried on below, the material being hoisted through a hole in the center of the platform.

We recently noted in these columns the rapid increase in the weight of locomotives. A similar growth is taking place in the cars, the Pennsylvania Railroad Co. having recently asked for tenders for 10,000 coal cars of 70 tons capacity and an overload capacity of 10 per cent. As the steel in the cars will weigh 20 tons exclusive of the wheels, the maximum weight of car and load may reach 100 tons.

Apocryphal of marine turbines, we note that Messrs. Parsons & Co., recognizing the advantages of twin-screw propulsion, as proved in the Curtis equipment of the scout "Salem," have developed a modified Curtis partial admission turbine which they are to install in one of the new 5,200-ton, 26-knot British scouts. A sister ship will have Curtis turbines. The Parsons turbines will weigh 340 tons, and guarantee full power on 13 pounds of dry steam per horse-power per hour. The Curtis turbine will weigh 250 tons and guarantee 12.5 pounds of superheated steam.

There are persistent reports that the Hamburg-American Line is about to build two huge steamers which will rival the White Star liners Olympic and Titanic, which are to be in service during 1911. The reported dimensions are: Length, 350 feet; beam, 92 feet, and depth, 66 feet. Reciprocating engines of 48,000 horse-power will drive the ships at a speed of 21 knots.

A recent bulletin of the United States Geological Survey gives some statistics of producer-gas power plants in the United States which are very favorable. There are over 500 plants in operation, aggregating 115,000 horse-power. The government testing plants at St. Louis and Norfolk show a fuel consumption of as low, under favorable conditions, as 0.95 pound per electrical horse-power. Comparative tests of 75 grades of bituminous coal under steam boilers and in producers show a ratio of 2.7 in favor of the latter.

One of the most important branches of the general scheme for the development of Japan is the extension of her railroad development along predetermined lines which have been laid out with an eye to the development of the country considered as a unit. A notable event in this development was the recent completion of the railway between Hitoyoshi and Kagoshima, which connected up the last link in the trunk line running throughout the full length of the empire. The total length of the line is 1,750 miles, and the distance from north to south of the island can now be covered in five days and nights. At the close of the fiscal year 1907-1908 4,452 miles of state railways were opened to traffic and 455 miles of railway controlled by private interests.

A promising installation of a windmill-electric plant has recently been completed at Worcester, England, by J. G. Childs & Co., of London. It consists of a 24-foot wind turbine carried upon a 75-foot tower. The generator is located at the foot of the tower, the battery and switchboard in one of the outbuildings of the house. Overhead copper cables carry the current to the battery some 455 yards distant. The generator which runs at 400 to 600 revolutions per minute is driven by a 5-inch belt from the vertical shaft of the wind turbine. It has a maximum output of 4 kilowatts with a normal pressure of 70 volts. The plant runs about 100 lights in the house, and serves also to drive a chaff cutter, a circular saw, and a root-pulping machine.

ELECTRICAL.

A company has been formed in London to introduce and encourage the use of electricity in the poorer districts of the city. The company agrees to wire and supply any apartment of three rooms and over with tantalum lamps, charging five cents a week per lamp from April to September and seven cents a week for the rest of the year. The lamps, however, must be renewed by the consumer.

A new mounting for metallic filament in lamps has been devised in Germany. The mounting provides for the shrinkage of the filament which is not always uniform, and for this reason each filament is supported at its lower end on a small spring which is covered with a paste of finely powdered tungsten so as to prevent it from being consumed by the heat of the incandescent filaments.

The use of the telephone for train dispatching is slowly spreading. The Gulf, Texas & Western Railroad is equipping its line with a telephone system for train dispatching between Jacksboro and Benjamin, Texas. The road connects the Chicago, Rock Island & Gulf and the Wichita Valley railroads. When the telephone system on the Spokane division of the Great Northern Railway is completed there will be 2,100 miles of this railroad operated by means of the telephone.

A hydro-electric plant in the Hakone Mountains, about 36 miles from Yokohama, Japan, has recently been completed and is particularly interesting for the fact that much of the apparatus used is of Japanese make. The Shibaura Electric Manufacturing Company of Tokio has built the 600-kilowatt air-cooled, oil-immersed transformers to be used at the sub-station in Yokohama. A large number of the high-tension insulators used on the line are of the Shibaura type. About one-third of the line is supported on towers, which is a new departure for Japan. At the power station the water is carried over a distance of 15,000 feet in two parallel pipe lines that lead to the turbo-generator units. The upper half of the pipe lines consists of riveted pipes made by the Shibaura Company. The plant comprises two 2,000-kilowatt alternators and the current which is generated at 3,450 volts, is stepped up to 46,000 volts for the line.

In a recent number of the Electrical World appears an interesting article on the wireless telephone, and the author arrives at the following conclusions: "It is, then, quite evident that future systems of wireless telephony must either eliminate the use of microphone transmitters or find types far in advance of those used to-day. In addition to this, some more powerful and more reliable oscillator must be substituted for the arc. If no great difficulties arise in its operation, and its cost be sufficiently reduced, this substitute may be the high-frequency alternator. With the few weak points of the present system removed and the useful parts of the apparatus retained, the wireless telephone will come into all the uses to which it is adapted, but the elimination of the defects will involve a departure from present methods. Until these are discarded, attempts at commercial wireless telephony will be futile."

The following useful electrical shop kink was published in a recent number of the Electric Railway Journal describing a method of soldering broken or burned-out wires without removing them from the armature: "The damaged wire is raised a little way out of the slot. The insulation is then scraped off for a few inches and the ends of the broken wire are filed off smoothly, after which a piece of wire is cut to fill the gap. One end of the inserted wire is then butt-ended with the armature wire and the ends heated by a gas torch until they are red hot. Upon this a little borax is applied as a flux, and then some silver solder is inserted between the ends. When both splices are completed in this fashion the bare wire is wound with silk, as the latter takes up less space than tape. After the silk has been covered with insulation the coil is ready to be returned to the slot. During the operation of heating with the torch the adjacent wires are protected by fiber barriers."

It is reported that at the time of the rescue of the crew of the steamship "Kentucky" by the "Alamo," which had been summoned by wireless telegraphy, the wireless apparatus had almost been put out of commission by the water that partially submerged the dynamo. By wrapping the dynamo with tarpaulins it was possible to keep the machine running until help arrived. This is not the only case of a rescue due to the help summoned by wireless telegraphy, and on a previous occasion the apparatus was put out of commission by the encroachments of the water. It has been suggested that storage batteries should be used to supply the current, because they could be placed where there would be no danger of injury by water. But as storage batteries would be impractical owing to the motion of a vessel in a storm, some arrangement should be provided for placing the dynamo and a gasoline engine for driving it well above the danger line.

SCIENCE

Recent experiments have proved conclusively that coal dust which has been ground to a state so fine that it will pass a 200-mesh sieve, will explode from contact with either a naked flame or with the arc of an electric current.

The building of an observatory on the rim of the great crater of Kilauea has been advocated for several years. The prospects are now brighter than they ever were, and it seems likely that the observatory will be built as part of the College of Hawaii.

A recipe for a non-shrinking alloy, to be used in duplicating patterns, is given as follows by The Metal Industry: Tin, 50 pounds; zinc, 50 pounds. This gives a tough, hard metal that runs well if a good grade of zinc is used. The addition of 2 pounds of bismuth will render it even more fluid and enable it to be poured at a lower temperature. By using heavy sprues and pouring cold, the shrinkage, which is slight, may be largely overcome.

Prof. E. E. Barnard recently obtained a photograph of Halley's comet showing a tail one degree long. The comet is beginning to wake up. Mr. Ellerman will sail for Honolulu on March 8th to observe the transit of Halley's comet across the sun's disk. He is sent out by the comet committee of the Astronomical and Astrophysical Society of America. He takes with him a good 6-inch portrait lens by Brashear and a 6-inch equatorial mounting lent by the Lick Observatory. He is perhaps the best possible man for the work, and will be thoroughly equipped to obtain the best results.

During the night between October 7th and 8th, 1909, a meteoric stone fell to earth on the farm of Mr. W. P. Nickerson, of Norwood, Mass. The meteorite is a ham-shaped mass of very hard gray stony material, much corrugated on the surface, about two and one-half feet long in its greatest dimension, one foot to nearly one and one-half feet broad, and varying from one foot to one-half foot in the third dimension. Its volume was estimated as about 1.75 cubic feet, its weight as perhaps 275 pounds, and its density as not much over 2.5.

Besides Halley's Comet, two other comets may be expected in 1910. The first of these is Tempel's, discovered July 3d, 1873, at Milan. It has a period of 5.75 years. It was observed in 1878, 1894, 1899, and 1904. It last passed perihelion in November. It ought, therefore, to be expected this spring.

The second of the expected comets is that of Arrest, discovered in 1851, and the return of which is expected in the summer of this year. It was observed in 1857, 1870, 1877, 1890 and 1907. It was unfortunately placed in 1903 and, therefore, could not be observed.

The chief purpose of the sound-proof room at the University of Upsala is the insuring of perfect freedom from sounds from outside. By building it on platforms of thick lead and cement, and by constructing its walls of many thicknesses of felt, cork, asbestos, and other bad conductors of sound vibrations, the principal object was attained. The room is so quiet that the beating of one's heart or the creaking of one's muscles is at once heard on taking up a position within its closed doors and windows, and the only defect of it as a laboratory for acoustic experiments is that ventilation is absent, and no one can remain in it for more than an hour at a time.

Prof. Lipmann announced before the Academy of Sciences that Madame Curie has obtained a tenth of a gramme of polonium, with which she has been experimenting. Polonium is a radio-active element discovered by Madame Curie as early as 1898, but not obtained before in sufficient quantities for elaborate experimentation. From the brief reports which have been received, it would seem that polonium in its earlier stages is more radio-active than radium, but it loses its power very much more rapidly. It seems reasonably certain that polonium is identical with radium F, one of the series of metals produced by the decomposition of radium. The particle of polonium obtained by Madame Curie is not entirely isolated, but was combined with several tenths of a milligramme of another body.

A special investigation of the motion of the bridge of the violin has been made by J. W. Giltay and Prof. M. De Haas of Amsterdam. They conclude from their experiments that the bridge of a violin performs a parallel as well as a transverse motion, and that the timbre of the tone is modified greatly when the intensity of one of the motions is altered and the other motion is left unchanged as nearly as possible. They have also explained the action of the mute, and the influence which the use of too thick or too thin a bridge has on the sound of a violin. The mute is commonly supposed to "dampen" or "deadens" the sound. If the mute caused nothing but a general damping by reducing the bridge motion, the mute would only weaken the sound, and the same effect would be obtained by bowing softly on a violin without a mute as by bowing hard on a violin with a mute. That, however, is by no means the case, as every one knows.

A NEW TYPE OF SELF-DISCHARGING COALING VESSEL

BY F. C. COLEMAN

The new system of belt-conveyer discharge has been installed by William Doxford & Sons, Ltd., in a new vessel—the steamship "Pallion"—which they have recently built at the Pallion shipyard, Sunderland, England, to the order of the Dunrobin Shipping Company, Ltd., of Newcastle-on-Tyne. This vessel has a length between perpendiculars of 270 feet, and a carrying capacity of 3,100 tons on a 17 feet 10 inches draft. The machinery, comprising triple-expansion engines and multitubular boilers, is placed aft. The cabin accommodation is fitted in the bridge, and the crew space in the forecabin, while the navigation accommodation is about midships. The inner bottom is raised and sloped upward in the wings and built into the sides of the vessel, forming a suitable incline for gravitating the cargo to the conveyers, and also giving the vessel the advantage of being about half-loaded when in ballast and bunkers. In the center line is constructed a slope-top fore peak throughout the hold, and between this tunnel and the tunnel extending from the engine space to the raised portions of the double bottom are placed the conveyer belts of the Robins pattern, one on either side of the vessel. The sides of the tunnel below the level of the hatchways over the belts are open for free access to the belts and carriers at all times. Over these conveyer belts are placed strong iron guide plates extending the full length of the hold and partially covering the belts, leaving a 24-inch hatch over a 36-inch belt. This space is covered in the holds by cross-laid hatch covers, 9 inches in length and 3 inches in thickness, which support the cargo and leave the conveyers to work without carrying the load. At the after end of the hold a portion of the hatch, over which the 9-inch hatch cover is omitted, is covered by a horizontal iron slide door, operated by a ratchet in the tunnel. On the fore side of the bulkhead is constructed an access chamber in free communication with the tunnel, which is of such a form as partially to protect the slide door from the cargo when loading, and in the floor of this projection of the chamber is fitted a flap hatch to give access to the hold from the tunnel. At the after end of the cargo space the conveyers rise from the horizontal and pass upward in iron chambers through the machinery space, and thence into the conveyer-driving engine room, and discharge the load into guide shoots in the stern of the vessel. These carry the load on to return belts, which are extended forward both sides on the deck. In a simple form these conveyers would terminate at the fore end of the machinery space, or poop front, and the load would be delivered into side shoots which telescope and are adjustable for loading barges on either side of the vessel, the shoots being suspended from derricks or other suitable means. In cases where the discharge is required at a higher level than is attained at the poop front and a large range of elevation is necessary, as, for instance, for delivery on high quays into trucks and into barges alongside, the conveyers are carried forward and hinged at the poop front, and the delivery end is suspended by suitable tackle from twin masts or framework, and is raised or lowered according to circumstances, delivering the load into telescopic shoots suspended therefrom. When the delivery is into trucks, the "offside" belt delivers amidships into a cross-conveyor suspended on the masts, which carries the load to the shore side and delivers by shoots into the trucks. A development of this principle has, however, been

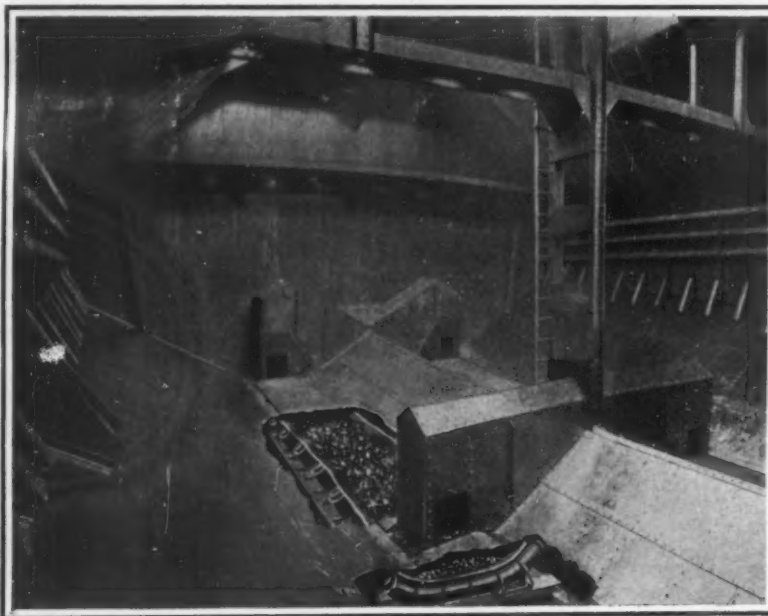
applied to the steamship "Pallion," as, in order to obviate the use of delivery shoots, which results in considerable damage, the terminal conveyers are carried in swivel booms, which are raised or lowered and swung overboard to the points of delivery, thus permitting of the cargo being conveyed direct to the truck or barge without shoots. These booms may also be swung across to the reverse side of the vessel, so that both booms can deliver simultaneously into trucks or warehouse. Another important feature of this dis-

The unloading of a cargo of coal is carried on as follows: Presumably the holds are full and the cargo lying solid, except under the overhang of the chamber on the bulkhead over the slide door, at which point the space is naturally only partially filled. The slide door in the covers over the conveyers is drawn back by the operator in the tunnel, and the loose coal over it immediately travels on to the conveyers, which may or may not have been started. If running, then the flow continues; if standing, no difficulty arises because the conveyer is only filled at that point, and the aperture becomes blocked and only clears and flows when the belt is started. Then, if no "bridging" occurs, the after part of the hold is rapidly emptied on to the conveyer which is carrying it on deck and into the receiving trucks or barges. If, however, any "bridging" is threatened, the operator in the tunnel ascends to the chamber, and has free access over the aperture to correct any block. If "bridging" occurs higher in the hold, then he breaks it by means of a pinch bar through perforations in the chamber sides. When the after end of the cargo has run to its natural angle of repose, the operator now in the hold merely removes the first cover and places it aft of the aperture, allowing another portion of cargo to run, he being in a free position to maintain the run and correct any tendency to bridging and to abnormal rushes. If such do occur and incline to block the aperture, he again corrects this, and, having run so much more, he removes the next segment of cover, and so on, gradually transferring the aperture from the after end to the fore end of the hold. The wing tanks and central tunnel being sloped, the cargo gravitates to the aperture, and the finals are manipulated by the operator, one man being on each side of the hold. An important feature is the inclined shoot, over which all the cargo passes on to the belt. This shoot is carried on travelers on the guide plate sides, and is moved by the operator in the hold forward from stop to stop to correspond with the movement of the aperture, thus allowing two men to manipulate a whole cargo at the rate of 500 tons per hour. It is estimated that in regular working the steamship "Pallion" will be unloaded in six hours, or allowing for stoppages in moving barges, etc., seven to eight hours, and this too with but one stoker, one engineer, two laborers in the hold, and two adjusting the shoots or booms into the craft. The total cost of discharging the cargo of the "Pallion" will not exceed \$60, including the upkeep of the gear; and it is affirmed that the cost of discharging a similar cargo at, for instance, the port of Hamburg, is about \$560, and that in the work no fewer than 110 men are employed for about eleven hours under favorable conditions.

A steamer such as the "Pallion" is independent of shore labor, and so may avoid the frequent delays arising from labor troubles. The number of men required is so small, and the time occupied so short, that it would be a simple matter to agree with the crew of the vessel that

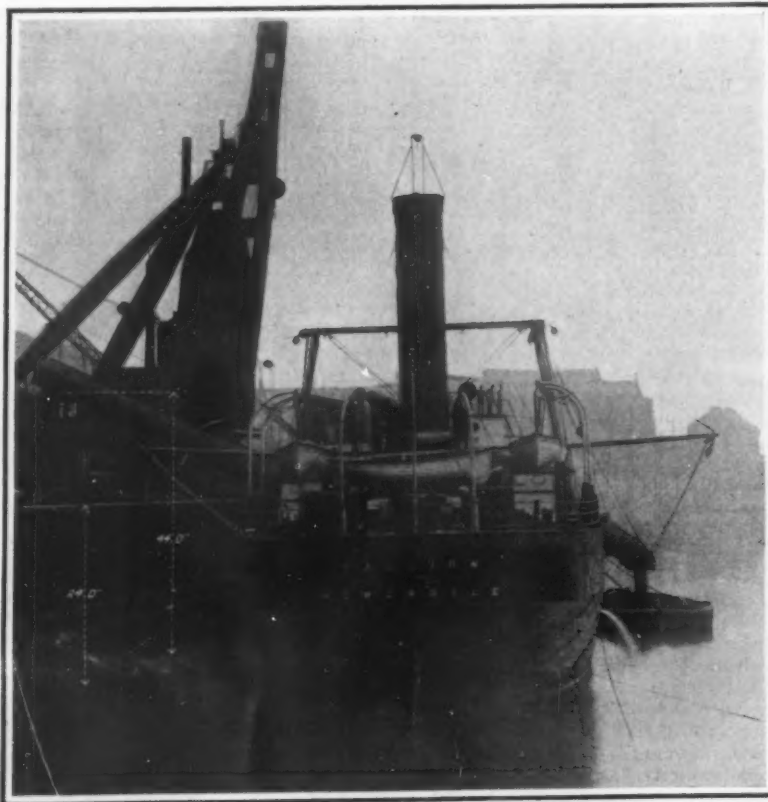
they receive a fixed extra wage, and the discharge of the cargo become part of their ordinary duty. A liberal estimate of the cost of discharge, under such conditions, would not reach the sum of two cents per ton, and at this cost the cargo is also weighed.

Roof Paint.—Mix 35 parts of powdered clay slate, 30 of powdered mica slate, 35 of powdered American rosin, with half the quantity of pure coal tar and boil until an easily brushable mass is obtained.



View of the hold.

The coal falls by gravity onto a conveyer beneath the floor by which it is carried along to the elevator belts of the discharge spouts.



The coal is taken from the bottom of the hold and discharged at an elevation of 40 feet above the water by conveying and elevating belts operated on the ship. Rate of unloading 500 tons per hour; cost two cents a ton.

A NEW TYPE OF SELF-DISCHARGING COALING VESSEL.

charging arrangement lies in the method of delivering the cargo onto the belts from the hold, and enabling the operator to have full control and free access at all times to the conveyers and to the face of the cargo. He may thus superintend and direct the continuous flow, and be in a position promptly to correct any tendency of the cargo to bridge or to choke the aperture leading to the belt, which, being the smallest space the load has to pass through, insures a continuous and uninterrupted delivery.

NOVEL ELECTRICAL APPLIANCES

BY PERCY COLLINS

The largely increased use of electricity for illuminating distilleries, wine-cellars, etc., has rendered obsolete many appliances which were formerly in use—especially those which consume coal-gas when in operation. Hence arose a demand for up-to-date inventions designed to meet the conditions imposed by progress. Few recent patents illustrate more strikingly the manner in which the ingenuity of mankind keeps pace with the exigencies of modern trade than those which are illustrated in the accompanying photographs. The patentee and manufacturer of these original electrical appliances is Mr. Frederic Hughes, of London, England, and it is to this gentleman that the present writer is indebted for permission to describe and illustrate the apparatus in question. In the case of the electric search-light or cellar-torch, Mr. Hughes claims that the appliance stands alone, being the only perfect, clean, odorless and reliable invention for thoroughly examining brewers' casks, vats, refrigerators, spirit or oil jars, etc.

The main details of the cellar-torch may be appreciated by reference to the accompanying photographs. The reader will see that it consists essentially of a powerful electric glow-lamp of peculiar design, supported at the end of a suitably curved rod. The circumference of this lamp is so small that the appliance can be used effectually through any orifice not less than half an inch in diameter.

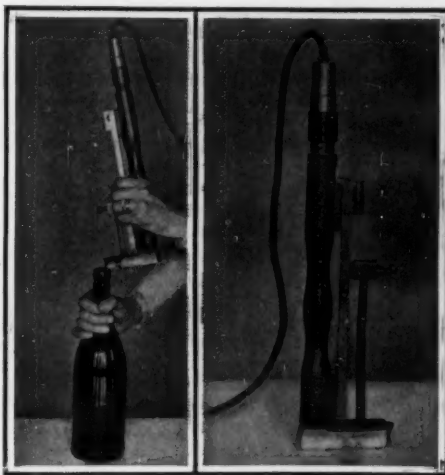
The advantages of this new cellar-torch will be most readily perceived if we compare it with the older appliances which it has superseded. The contact of a gas jet, or a taper flame, with a cold surface (such as the inner wall of a cask or jar) immediately produces a deposit of soot, which may be too slight to attract the notice of the searcher, but will nevertheless discolor and injure to a greater or less extent the fluid with which the vessel is ultimately filled. Similarly, when gas is used to "nose" casks, the products of combustion combined with the CO₂ already in the cask and the pungent odor involved, conceal the mustiness, and thus deceive the examiner, who accordingly certifies as clean a vessel which, as a fact, is far from being so. With the patent searchlight or cellar-torch the examination may be prolonged indefinitely without in the least affecting the actual odor of the vessel's interior.

As the heat generated by the lamp of this cellar-torch is very slight, the appliance may be employed for the examination of vessels containing all kinds of inflammable fluids or gases without the smallest risk of explosion. Each torch may be fitted at will with an oblong or circular mirror, which is screwed to the extremity of the appliance beyond the lamp. Upon being passed into the jar or cask, a slight pressure against the side or bottom of the vessel causes the mirror to assume a horizontal position, and by this means a view of the under surface of the vessel is readily obtained. The advantages of this device will be at once apparent to the practical reader, who will readily perceive that by no other means can the whole interior wall of a closed vessel be so thoroughly explored. Indeed, for the thorough examination of the interiors of bung staves, bushes, boiler tubes, etc., there is no more perfect appliance obtainable than Hughes's cellar-torch fitted with a reflector of suitable shape.

In conjunction with his patent electric torch, Mr. Hughes has recently introduced another novelty in the thermo-cere or wax-melter. This is an ingenious appliance by means of which a perfectly controlled supply of melted sealing- or bottling-wax may be obtained. Like all the most important patents, the apparatus is simple in design and effective in use. When connected by means of the flexible wire with the source of electrical current it is held in the left hand—the right hand being perfectly free for use. A stick of wax is fitted into the holder and held in place by means of a screw clip. The left thumb (overcoming a spring) presses the wax downward against the heating receptacle, and by slightly inclining this the melted wax flows through a lip on to the letter, bottle, or other object which is to be sealed. Of course, as the wax melts, the stick shortens, and to complete the melting of the entire stick a slight movement of the hand downward on the handle enables the thumb further to press the wax until the whole stick is consumed—the wax holder traveling in a grooved socket.

Whenever it becomes desirable to check the flow of melted wax, the pressure of the thumb is relaxed, when the spring causes the wax to rise just sufficiently to free it from the heating pan. A few of the advantages of the thermo-cere may be enumerated. In the first place, the

appliance may be used in the most confined space, and in any circumstances, with absolute safety from the fire risk which is so constant a danger wherever naked gas jets and flexible rubber tubes are employed. Again, the greatest possible economy in the use of wax is obtainable, there being no possibility of waste through carelessness, for the reason that melting is automatically stopped the instant that



Wax melter in use, sealing bottle cork.

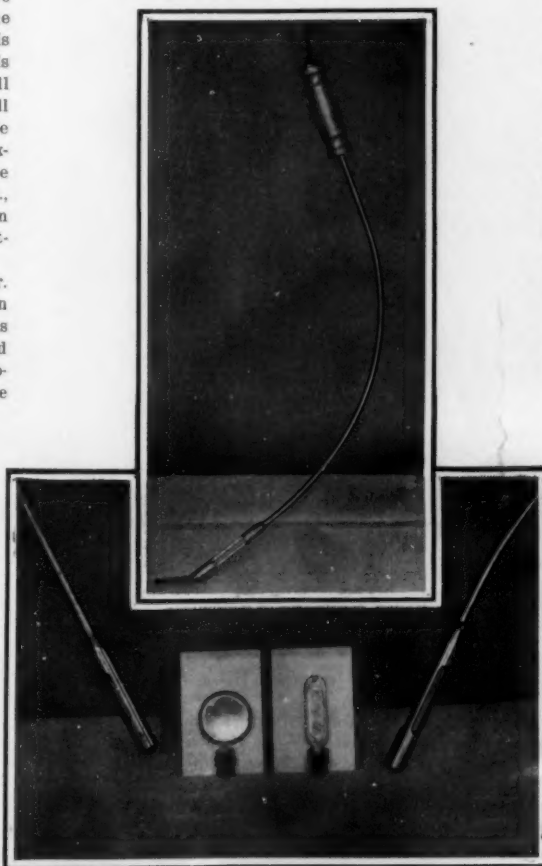
The electric wax melter.

the appliance leaves the hand. No discoloration or smoking of the wax is possible, and the most delicately tinted sealing-wax will remain perfectly true to the original shade. Finally, the sealing can proceed continuously, and in any position, the appliance needing no preliminary preparation, while all splashing or dropping of the wax is entirely avoided. The thermo-cere may therefore be used for sealing letters, postal packets, etc., while articles of value may be safely left in close proximity without the slightest risk of their catching fire.

The New Agricultural Fertilizers.

The manufacture of fertilizers is one of the most important of chemical industries, but this manufacture, together with the exploitation of the nitrate

The flexible electric cellar-torch.



Cellar-torch heads, showing lamp and mirror (detached).

NOVEL ELECTRICAL APPLIANCES.

beds of Chile and the potash deposits of Stassfurt, is now in a critical stage of development, owing to the increasing production of nitrogenous fertilizers by the fixation of atmospheric nitrogen, and also to the results of recent experiments on the fertilizing effect of extremely minute quantities of totally new agents. The properties of both classes of these new fertilizers are briefly described by René Valler in *Revue de Chimie pure et appliquée*.

I. NITROGENOUS FERTILIZERS OBTAINED FROM THE ATMOSPHERE.

Nitrates. Neutral nitrate of lime, containing 13 per cent of nitrogen, has been manufactured at Notodden, Norway, since 1905. It is an excellent fertilizer and equal in all respects to Chile nitrate. It can be mixed with superphosphate without causing appreciable loss of nitrogen or retrogradation of phosphoric acid. Its hygrometric character makes its application somewhat inconvenient, but it possesses, in contrast with Chile nitrate, the advantage of adding to the soil lime, an indispensable plant food, instead of soda, the accumulation of which may be injurious to vegetation.

It appears probable that Chile saltpeter will, before long, be supplanted by nitrates obtained from atmospheric nitrogen. The Birkeland-Eyde and other processes now in use are commercially practicable, in their present form, only where water power is cheap, but these processes are susceptible of great improvement. An efficiency equal to that of most other processes of industrial chemistry would make it commercially feasible to produce nitrates everywhere. At present the nitric acid obtained from the air is neutralized with lime, while most of the world's production of sulphuric acid is employed in the manufacture of superphosphates. If this nitric acid could be used to convert the tribasic calcium phosphate into the superphosphate, an enormous saving could be effected and a fertilizer produced which would contain both soluble phosphoric acid and nitrogen in a form suitable for assimilation, and would drive every other nitrogenous or phosphated fertilizer out of the market.

Cyanamides. The difficulty of applying the light cyanamide powder has been overcome by adding a little water, which combines with the quicklime of the crude cyanamide and forms a coarse powder called granulated cyanamide, which is much more convenient in use. A still better form is oil cyanamide, made by mixing the fine powder with 4 per cent of crude petroleum. The proportion of nitrogen in commercial cyanamide has been increased, by improvements in manufacture, from 15 per cent to about 20 per cent, that of pure calcium cyanamide being about 35 per cent. Cyanamide has now fairly entered into agricultural practice. The trust which controls the sale of the product in Germany and Italy sold 3,000 tons of cyanamide in the first half of last year.

Calcium cyanamide (CN₂Ca), treated with water and carbon dioxide, yields dicyanamide (C₂N₂H₄) in the form of nearly insoluble colorless crystals, which contain 66 per cent of nitrogen and form the richest nitrogenous fertilizer ever produced. In some cases the cost of production of dicyanamide may be counterbalanced by the economy in transportation. Applied to wheat in the quantity of 30 or 40 pounds per acre, it has produced excellent results.

Guillin has proved that more than one-fifth of the nitrogen of cyanamide is converted into ammonia in one week and more than one-third in two weeks, by the action of soil moisture. Muentz and Nottin observed in two months a production of nitric acid corresponding to 11/12 of the nitrogen of the cyanamide added to the soil.

The poisonous action on plants which was at first attributed to cyanamide fertilizers appears to have no existence, or to be due to impurities. The germinating power of wheat treated with pure cyanamide or dicyanamide is not diminished, but is sometimes increased. Muentz and Nottin, however, observed a temporary arrest of growth after the application of cyanamide in hot, dry weather, and therefore advise the selection of a wet period for its application.

II. FERTILIZERS CONTAINING MANGANESE.

Manganese is widely distributed in nature and plays an important part in the formation of the diastases which are the principal agents in vegetable synthesis. Nagaoka, in Japan, applied manganese sulphate to rice plantations in quantities equivalent to from 10 to 50 pounds of Mn₂O₃ per acre, and obtained increases of crop of from 22 to 37 per cent. The beneficial effect persisted, to a smallest extent, through the following year. Manganese chloride, a waste product of the chlorine industry, exerts a similar action.

In Europe, Voelcker and others have obtained increases in the crop of wheat up to 20 per cent from the application of from 25 to 50 pounds of manganese sulphate per acre. Excessive doses (100 pounds) diminished the crop. Similar results were obtained with oats.

Grégoire, Hendrick and Corplaux observed little benefit from the application of manganese to sugar beets, but Gasola obtained increments of 46 per cent in roots and 26 per cent in sugar from manganese chloride, and of 24 per cent in roots and 55 per cent in sugar from manganese sulphate—the chloride diminishing and the sulphate increasing the richness of the juice.

With flax, Garola obtained the surprising increase of 54 per cent in totally dry weight from manganese chloride, and 31 per cent from manganese sulphate. He concludes from his analyses that the manganese applied is assimilated by the plants and that the difference in molecular weight of the chloride and sulphate determines the degree of influence on the formation of diastases.

But the effect cannot be wholly due to the manganese which is assimilated, for Bertrand found no more manganese in oat plants, the growth of which had been increased by manganese, than in the control plants, to which no manganese had been applied. And recent American experiments have proved that fertilizing agents act partly by destroying the toxins left in the soil by the preceding crops. Unstable manganese salts might be expected to promote the oxidation of these toxins. Manganese oxide, traces of which occur in most soils, is entirely inert. The greatest proportion of successes has been obtained with manganese sulphate.

III. STIMULANTS AND POISONS.

American experimenters have revived the old theory of De Candolle, and proved that infertility may be due to poisonous excretions. It is conceivable that minute doses of powerful poisons might destroy these excretions or prevent their formation.

Copper Salts. The salts of copper have long been employed for the purpose of destroying fungous parasites of the grape, and fields of young grain can be freed of certain noxious weeds without injuring the grain plants by spraying with a 5 per cent solution of copper sulphate. Quite recently Bréal has increased the yield of maize by from 27 to 86 per cent by soaking the seed corn in a copper bath and then drying it before planting. The bath was composed of 3 parts by weight of copper sulphate, 30 parts of starch and 1,000 parts of water.

Zinc. Javillier, inferring, from the presence of zinc in many plants, that this metal must perform some function in vegetable physiology, made an extensive series of experiments, which proved that infinitesimal quantities of zinc promote the growth and multiplication of mold and yeast fungi and some chlorophyll-bearing plants. For example, the growth of a certain mold was stimulated by cultivation in a medium containing 1 part of zinc in 50,000,000, the maximum increase was produced by proportion between 1 in 10,000,000 and 1 in 25,000, and still stronger solutions exerted an unfavorable or toxic influence. Micheels and De Heen find that zinc salts promote the germination of wheat.

Alum. The large proportion of alumina found in the ash of certain exotic plants (more than 50 per cent in the Australian tree, *Orites excelsa*) led Yamano to try the effect of aluminous fertilizers. Common alum, added in the proportion of 1/5 per cent to the water in which young barley plants were growing, quickly killed the plants, but proved much less injurious to barley growing in the ground. A distinct fertilizing effect, manifested by increase of crop, was observed to follow the application of 1/20 per cent and 1/500 per cent solutions of ammonia alum to barley and flax, the effect of the ammonia having been carefully eliminated.

Magnesia. The presence of magnesia in all plants and in all soils long ago suggested the employment of magnesia as a fertilizer. Tribot's recent study of the influence of magnesia in the transformation of saccharose proves that magnesia can act as a ferment. Magnesian fertilizers were formerly employed, to some extent, and with good results. In recent experiments magnesia has been found to increase the crop of grain, potatoes and beets, chiefly by promoting the assimilation of nitrogen.

Bromine. Aso finds sodium bromide stimulating in very small doses and poisonous in larger doses to beans growing in pots. One part of bromide to 50 million, 5 million and 1 million parts of earth produced increases of crop of 93, 48 and 29 per cent, respectively.

Iodine and Fluorine. Potassium iodide, applied in dilute solution, appears also to act as a stimulant or a poison, according to the dose. Aso and Susuki obtained a large increase in crop of rice from about 1.40 pound of the salt per acre, but very little increase from 1/4 pound, while Hoffnung diminished the crop of sugar beets by one-fourth, by applying about 4-10

pound per acre. Analogous results were obtained by the same experimenters, with sodium fluoride, applied to the same crops.

Rare Elements. Cerium, like manganese, appears to act as a ferment. Aso finds thorium rather injurious than beneficial to vegetation. Nakamura has increased the yield of rice, growing in pots, by 70 per cent., by mixing with the soil 1-100,000 of its weight of lithium carbonate, but a dose 10 times greater produced a smaller increase (55 per cent); caesium carbonate, in the same doses, produced increases of 12½ and 9 per cent.

IV. BACTERIAL FERTILIZERS.

The discovery of the mechanism of nitrification and the fixation of atmospheric nitrogen by the bacteria of root nodules, soon led to attempts to aid the process by the addition of nitrogen-fixing bacteria. In 1895 Nobbé and Hiltner patented a process of inoculating peas and beans and the soil in which they grow by soaking the seed with an infusion of a gelatin culture of the bacteria of the root nodules. Bayer offered a pure culture of Ellenbach's bacillus, mixed with potato meal, but Maerker soon concluded, from the contradictory results obtained, that the preparation had failed to prove its value. In 1904 the United States Bureau of Agriculture distributed 12,000 boxes of bacterial cultures, which appear to have produced good results, in the majority of cases.

But the effect of these preparations is uncertain, as the abrupt change of medium may avert the development of the bacteria. The soil naturally swarms with nitrifying bacteria, but their growth may be checked by various causes, which will have the same effect on the few millions that are added.

Stocklase has endeavored to obtain hardier varieties by cultivating the bacteria in a large mass of earth, and has obtained remarkable results, but in view of the uncertainty mentioned above, it is prudent to defer judgment until several more years of experiment have elapsed.

V. THE VALUE AND THE FUTURE OF THE NEW FERTILIZERS.

The value of the nitrogenous fertilizers obtained by artificial methods has been abundantly and decisively proved, but the same statement cannot be made in regard to the other new fertilizers, every one of which has given contradictory results in the hands of different experimenters. Similar uncertainties, however, attended the early experiments with other chemical fertilizers, the value of which is now universally recognized. We have learned how to use nutrient fertilizers and we shall learn how to use stimulants. And this knowledge will be productive of incalculable benefit to agriculture.

Charcot and the Antarctic.

Lest anyone should suppose that Dr. Charcot went to the Antarctic largely for the purpose of reaching the pole, it may be said at the outset that his chief object was one of scientific research only. He only reached latitude 70 degrees, and, therefore, can hardly compare in achievement with his predecessors, and notably with Shackleton and Scott. What he did was to explore a region of archipelagoes and waterways, of which very little is known, and to broaden our knowledge of an ice barrier which extends westward from the South Shetland Islands unbroken.

Although Dr. Charcot returns with none of the laurels of Shackleton and Scott, his explorations will be of much assistance to future Antarctic explorers. From the meager account of his findings, it would seem that any attempt to approach the pole by way of the straits of the South Shetland Islands is doomed to failure, and that Commander Peary's plan of attacking the pole by a direction opposite to that pursued by Shackleton is hopeless. So far the only starting point that holds out any promise at all is the base of Ross's ice barrier, where the volcanoes Erebus and Terror are to be found. Here and here only can an expedition winter not more than a few hundred miles from the pole.

The Current Supplement.

The current SUPPLEMENT, No. 1782, contains some very striking illustrations of the Paris flood, which show to what extent the capital of France has suffered from the inundation. Mr. H. F. Stimpson contributes an excellent article on efficiency in shop operations, in which he shows how shop efficiency can be increased, as well as some results secured by the methods which he advocates. Mr. Claude Grahame-White, in an article "Some Experiences of an Aviator," sketches his own experience, and thus shows many an aspiring aviator what he has to avoid. Another paper on explosives for use in coal mines by Munroe and Hall is presented. The second and concluding installment of the article on the Wright Injunction, containing extracts from the court's opinion and the briefs, is published. E. P. Buffet concludes his splendid biography of Leonardo da Vinci, in which he pays a tribute to that great man's engineering ability. When the Nobel Prize was awarded to Mr. Mar-

coni, he read a paper at Stockholm, in which he summarized the recent development of wireless telegraphy. That paper is published in the current SUPPLEMENT.

An Injunction Against Paulhan.

Judge Hand, in an opinion filed in the United States Circuit Court, granted the injunction *pendente lite* asked for by the Wright Company against Louis Paulhan, the French aviator, alleged to be using in his exhibition flights here a machine which is an infringement of the patents granted to Orville and Wilbur Wright. This decision prohibits Mr. Paulhan from using his machine in this country pending the trial of the Wrights' suit against him.

After discussing the prior discoveries cited by the defense, Judge Hand in conclusion says:

"It is, of course, unusual to grant a preliminary injunction before any adjudication and without any acquiescence. However, when the right is not seriously attacked, and when the infringement is clear, the court should not hesitate to interfere.

"From the showing made I cannot doubt that the complainants first put into any practical form the system of three-rudder control. That there may be other systems is not the point; let the defendant use those if he will. Nor is it necessary to conclude that the complainants were the first to fly. Upon that I decide nothing whatever, for it is not an issue in the case.

"All I do say is that I cannot find that anyone prior to their patent had flown with the patented system, and that the changes from the specifications which the defendant had made are no more than equivalents which do not relieve from infringement.

"It is quite clear that for the complainants' protection a writ must go *pendente lite*, because the defendant, being a non-resident, who is here transiently, there is no way in which they may insure themselves of the monopoly they have acquired except by preventing his use of it at once."

A Library in the Sahara.

The French Colonel Gaden, who recently led an expedition into the southwestern region of the Sahara, found in the course of his investigation that one of the most powerful princes there, the Sheik Sidia, was the founder and possessor of a rather large library, a report of which is published in the latest number of the *Revue du Monde Musulman*. This library is small, indeed, when measured by our ideas of such a foundation, for it contains only 683 books and 512 manuscripts. Still it not only proves that a most urgent need of books has seized the most distant outpost of Mohammedan cultivation, but also provokes most lively interest in consequence of its composition.

Approximately the books comprise thirty groups relating especially to Koranic erudition, the doctrine of faith, history, jurisprudence, philology, travel and discovery, poetry and fiction, married life, magic recipes, interpretation of dreams, and astrology. The library, therefore, bears the impress of sheer orthodoxy, which is further manifested by its lack of books from forbidden provinces, such as philosophy and the natural sciences; but already the existence of printed books, the production of which is deemed a rigorous contradiction of the strict tenor of the Koran, proves that the revolution in the production of books, which began in Stamboul toward the end of the eighteenth century, has to-day acquired citizenship in the whole Islamic world, and that at no remote day also in this circle of culture and of passionate political aspiration and achievement the printed book will force the written book into a very dim background. Islam, long obstructed by crass ignorance of many foreign things among them books especially, which could have exercised a most beneficent influence on its daily life, is now quickened by the frequent book in its own tongues, which comes galloping from European publishers even into the precincts of its haughtiest orthodoxy. The printed book is already an irresistible leaven in Islam.

Death of Alfred Spear.

Alfred Spear of Passaic, N. J., died at his home in his 87th year. He was one of the first who ever conceived the idea of a moving sidewalk. His model interested such men as Peter Cooper, Horace Greeley, and several other prominent men. The scheme had so much to commend it that two Legislatures, those of 1873 and 1874, authorized the use of his sidewalk, but the Governor of the State vetoed the bills.

The Sensitiveness of the Telephone.

Preece has calculated that an audible sound is produced in a telephone by a current of 6 by 10⁻¹³ amperes, and Pellat has calculated that a sound is produced by a difference of potential between the two stations, amounting to only 1-2000 volt. These statements give some idea of the great sensitiveness of the modern telephone, but the sensitiveness of the human ear, which perceives the invisible vibration of the telephone diaphragm, is no less remarkable.

Correspondence.

HOW A TROLLEY CAR REVERSED ITS POSITION.

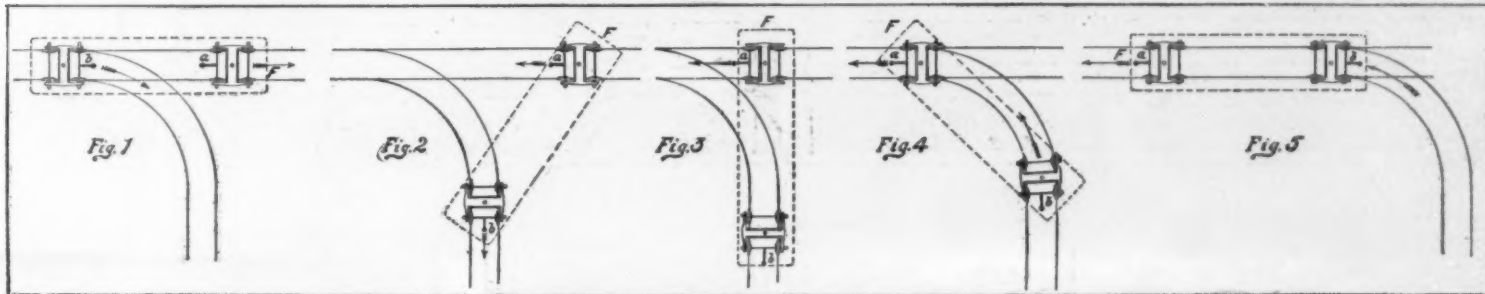
To the Editor of the SCIENTIFIC AMERICAN:

On January 20th, 1910, about 12.40 P. M., a curious and unique accident happened in regard to limited car No. 230, D. and F., at the crossing of Main and Ash Streets, Piqua, Ohio. The phenomenon was so remarkable that I have concluded to make this report of it, and if you see fit you may lay it before your readers.

The car was headed south on Main Street, running perhaps ten or twelve miles per hour. At the switch in Ash Street, where connection is made with the city line, the rear truck left the main line and followed the Ash Street line, and the car body turned completely end for end, returning almost completely to the main line. Neither truck was at any time off the rails and even the trolley wheel was still in working contact with the over-head wire when the car stopped. The brake rod connections were all stripped and torn loose, also the wire connections from controllers to motors were severed. No one was seriously injured, and a casual observer coming on the scene, as the writer did, a few minutes after the occurrence would not notice that anything out of the ordinary had transpired.

The attached diagram shows five positions assumed by the car in its wonderful evolution. The relative position of the truck with reference to the body and also to the tracks is shown, the end of the truck normally positioned toward the center of the car body being indicated by *a* and *b*. The end of the car headed south before the accident is indicated in each figure by *F*.

Fig. 1 indicates the status of things when the truck



b is about to turn from the main line. Figs. 2, 3, and 4 show intermediate positions, and Fig. 5 the car when it came to rest.

E. B. RAYNER.

Piqua, Ohio.

[The mere momentum of the car would not account for the return of the car to the main line. The fact that the trolley wheel remained on the line suggests that the motorman must have reversed the rear motor, which acted to push the car back in the reversed position to the main line.—Ed.]

MISS PECK REPLIES TO MRS. WORKMAN.

To the Editor of the SCIENTIFIC AMERICAN:

Having observed in your issue of February 12th a letter in reference to the altitude of Mount Huascarán and my record from Mrs. Workman, may I state my own position a little more definitely?

After making the ascent of Mount Huascarán, north peak, September 2nd, 1908, of which I brought back absolute proof in the shape of photographs, I gave my reasons for believing the mountain to have an altitude of 24,000 feet, although on account of the high wind I had been unable to take hypsometric observations on the summit.

Naturally, I did not expect the scientific world or anyone else to regard my estimate as an exact measurement. If anyone did so, I cannot be responsible.

It was, of course, quite within the province of anyone to take so great an interest in the matter as to spend some thousands of dollars in sending engineers to Peru to make a triangulation of the mountain, and to publish this as the absolute height of Huascarán.

There is, however, something to be said in regard to the accuracy of such triangulations. Permit me to quote from the recent work of Mr. A. L. Mumm (of the English Alpine Club), "Five Months in the Himalayas":

"The results of triangulations do not always agree, and even when they practically coincide, they cannot be accepted as absolutely unimpeachable. There is good reason to suppose that the effect of refraction is not yet sufficiently understood for the allowances made for it to be perfectly accurate; and the higher and more remote the summit, the larger is the possibility of error. Bearing these facts in mind, it will be apparent that anyone who starts to form a decided opinion as to what persons are entitled to the honor of having reached the highest elevations has a very pretty tangle to unravel. And I will leave it at that. Longstaff [who made the ascent of Yrisel, 23,400 feet] lays no claim to any record, and goes out of the way like a good sportsman to establish the record of a predecessor."

Another disinterested authority is Dr. Norman J. Collie (also of the English Alpine Club), who has had

much experience in the Himalayas and who stated to Prof. H. C. Parker that the amount to be allowed for refraction on high snow mountains was most uncertain, that therefore the altitude of the great Himalayan peaks, though given in precise figures, was still in doubt.

Furthermore, I once met a former member of the British Royal Engineers who told me that the triangulation of the well-known mountain K² recently attempted by the Duke of the Abruzzi, was made by a friend of his, whose allowance for refraction was double what he thought should have been made. With the smaller allowance K² would be about 4,000 feet higher than it is now regarded.

It is therefore obvious that if similar allowance for refraction is made on Huascarán, it may easily happen, especially in a country with a much drier atmosphere than India, that the mountain is 1,000 or 2,000 feet higher than has been figured.

Accordingly, while it is perfectly proper for all who desire to do so to accept the figures of the triangulation, regardless of the careful estimate of myself and of the Swiss guides and of the evidence of the photographs, no one need feel obliged to accept those figures as final.

As to Aconcagua being the highest of the Andes, I may say that aside from Huascarán there are several mountains which may prove when carefully measured to be of greater altitude than Aconcagua.

In this connection it may not be wholly out of place to say that while Mrs. Fanny Bullock Workman has, according to the newspapers, frequently announced her readiness to furnish evidence of the altitudes claimed by herself, when I wrote to her stating that I should be glad to see the figures of her observations, an interest shared by some other Alpinists, she informed me that they had not been published in any of her

writings, nor did she offer to give them to me personally.

ANNIE S. PECK.

New York, N. Y.

The Aero-nautic Show at Boston.

The first exhibition of aeroplanes, balloons, and aeronautic apparatus exclusively to be held in the United States was held in Mechanics Hall, Boston, Mass., from the 16th to the 23rd instant. This first Aeronautic Show, although fairly representative of the different experimenters, was somewhat of a disappointment in that there were no motor-driven heavier-than-air machines exhibited that have actually flown, while 50 per cent of the power machines were shown without motors. This fact, however, did not deter one from getting a good idea of the design and construction of the aeroplanes proper.

The question of reliable light-weight motors at a reasonable price is still a burning one, and a fortune awaits the man who will produce such motors—of 25 and 50 horse-power respectively—to supply them to aviators upon easy terms. Eight different makes of motors were on exhibition, three of these (Curtiss, Cameron, and Harriman) being of the 4-cylinder, 4-cycle type, two (Waterman and Duryea) of the 4-cylinder, 2-cycle type, and two (Easton Cordage Company and Buffum) of the 4-cycle, 8-cylinder and 12-cylinder V type respectively. An Elbridge 3-cylinder water-cooled 2-cycle motor was also shown on the Wright type biplane of F. P. Schneider. The 25-horse-power, 4-cylinder Duryea motor, which was shown upon the Bleriot type monoplane of Stanley Y. Beach, is air-cooled by means of thin copper strips wired to the cylinders. The Cameron motors—a 4 and a 6-cylinder of 30 and 45 horse-power respectively—are also air-cooled with the usual cast flanges. The smaller of these two motors and the Duryea motor both weigh about 200 pounds, or approximately 50 pounds more than the Curtiss 25-30 water-cooled motor with radiator and water. The reason for this apparent superiority of the water-cooled motor as regards weight is found in the fact that the Curtiss is a specially constructed aeronautic motor, whereas the air-cooled motors mentioned are simply automobile motors adapted to aeronautic use and not lightened nearly as much as it is possible to lighten them. The same may be said of the Elbridge, which is a marine motor. The Waterman, another light marine motor built for canoes and dories, weighs just under 100 pounds complete with flywheel, which can be dispensed with, and develops about 15 horse-power.

The Harriman is a special 4-cylinder motor of 50 horse-power and weighs 200 pounds. It has copper water jackets and aluminium crank-case. The bore and stroke are 5 inches. The 8-cylinder V-type motor has crank-case and cylinders cast of macadamite. The cylinders are lined with cast iron and the pistons also are of a special grade of this metal. The bore and stroke are each 4 inches. The output is 50 horse-power at 1,200 revolutions per minute. The 12-cylinder V-type Buffum motor is constructed similarly to the Easton, each row of cylinders being cast in one piece with the upper part of the crank-case and afterward being bored and lined with cast iron. This motor is beautifully finished. Its weight complete is but 415 pounds, and an output of 100 horse-power is claimed for it at 1,800 revolutions per minute.

Upon entering the large main hall of Mechanics Building the visitor saw upon his right the Bleriot and Antoinette type monoplanes of the Scientific Aeroplane and Airship Company of New York. The former of these machines, which is fitted with a 4-cylinder, air-cooled, 2-cycle motor, has lately been experimented with upon ice by Mr. Stanley Y. Beach and is in a fair way of making a flight in the near future. The Antoinette type monoplane was shown with a huge red 9-foot propeller of special design, which has been found to be very efficient. A novel type of steering gear having two superimposed wheels was also fitted. Opposite these two machines were two Wright type biplanes of Frederick P. Schneider. The finished one of these two machines had movable flaps upon the rear edges of the wings instead of the warping arrangement used by the Wrights.

Proceeding onward around the hall, the visitor next saw two new monoplanes—one (the Morock) a small demountable Bleriot type machine having wings laced upon steel tubing and the other (the Burlingame) a

large monoplane with trussed inclined struts running from the bottom of the wide central frame to the ends of the wings. A 50-horse-power Harriman motor, direct-connected to a large and thick propeller, was placed at the front of this monoplane.

A biplane that attracted considerable attention was that of Victor Page. This had a rectangular central body and extremely thick wings with a deep curvature. A novel revolving cylinder 2-cycle motor (the L. A. W.) was pivoted in front, so the propeller mounted upon it could be directed upward or downward.

The Hayward and Erickson biplanes were constructed entirely of bamboo. In general outline they resembled the Curtiss, as did also the Elsner & Downey and the Reaud machines. The Erickson biplane had a Buick automobile motor weighing 240 pounds fitted, the weight of the biplane alone being but 220 pounds.

The finest piece of construction on exhibition was the Herring machine, built by the Starling Burgess Company, a well-known boat-building concern of Marblehead, Mass. This machine, in general appearance resembling the Curtiss biplane, was mounted upon three round skids, no wheels being used. The horizontal rudder was worked by the aviator's feet, and the vertical rudder by hand. A long, inclined rod was placed on each side of the seat, to which the aviator can cling. Springs were introduced in the guy wires, no turnbuckles being used. The poles that carry the front and rear rudders were all hollow. A Curtiss motor with a 4-bladed propeller of Mr. Herring's design was fitted. The machine complete weighed less than 400 pounds. The propeller is said to give 260 pounds thrust, which, it is claimed, is ample to start the machine on any ground on its skids. The stability device for lateral equilibrium was not exhibited.

There were also several gliders on view, and a large number of models of all kinds, most of which were built by boys. The exhibition as a whole was a very creditable one. It leads one to believe that America will soon catch up to Europe in the aeronautic industry as it did with the automobile.

Balloons were also in evidence. Among them was the New England Aero Club's balloon in the very middle of the hall, inflated almost to its full capacity. This balloon has made 45 ascensions and has traveled 1,251 miles. Leo Stevens exhibited the basket of his 20-passenger, 160,000 cubic foot balloon. A huge hot-air balloon from which a trapeze performer made five parachute drops at Coney Island last summer is also to be seen.

THE COCHIN FOREST RAILWAY

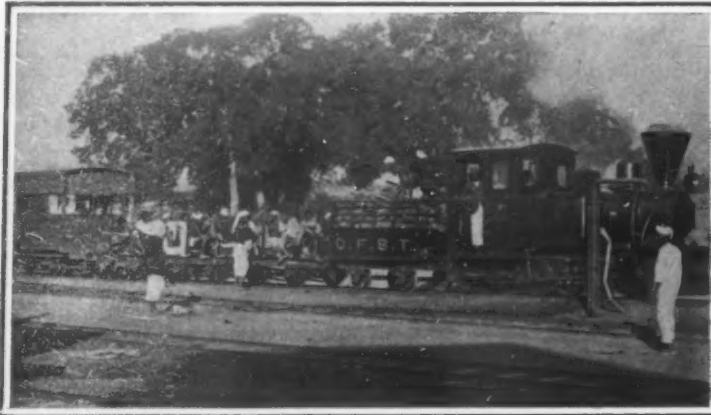
BY EDWARD HARRAN

The Cochin Forest Tramway is an interesting little line of tramway on the meter gage in the semi-independent State of Cochin in South India. It runs slightly to the north of the 10th parallel of latitude and to the east of the 75th parallel of longitude, and owes its origin to the fact that the forests of Cochin form one of the most valuable assets of the State, their approximate area being 505 square miles, or nearly one-half of its entire extent. Their commercial importance, it is stated, was vaguely realized as far back as the beginning of last century, but the earlier attempts to work them were of the usual spasmodic and unsystematic nature which characterized original efforts in forestry throughout the Indian peninsula. In the year 1835, however, a regular forest department, under the control of a European officer, was formed and worked for some sixty years on old-fashioned lines. Though the department throughout this period brought in a certain amount of revenue to the

fact that a land route, provided means of transportation over it were available, would tap a far richer forest area than a proposed river route alone, while, of course, it would be open all the year round. So it came about that the idea of a tramway in three sections arose, was recommended to and sanctioned by the Durbar. The first section was to cover a distance of 8 miles in the valley, to be followed by a self-acting inclined tramway 5,000 feet long. The second section, $4\frac{1}{2}$ miles long, was to be followed by a slide 7,000 feet long, whence the third section, also $4\frac{1}{2}$ miles long, was to extend to the Kurumali River, from which point timber could be floated to the railway station at Trichur during the monsoonal period and carted to the Chalakudi Station in the dry weather. According to this first propounded scheme, timber from the hitherto unworked Parambikolam Forest was to have been floated by the Parambikolam River to the tramway terminus in the valley. A visit paid by his

logs both at the head and floor of the slide proved expensive. To remedy this latter, the conversion of the slide into another self-acting incline was decided upon. To remedy the first, Mr. Alwar Chetty recommended, and the Durbar sanctioned, another extension of the tramway, one of 15 miles to Chalakudi, to meet the Shoranut-Cochin Railway at that station, a connection, with the acquiescence of the Madras Railway authorities, being made between the railway and tramway there.

To-day the total length of the line as it stands completed at the time of writing is $49\frac{1}{2}$ miles divided into three sections. The first section extends from mile 1 to 21, the second from mile $22\frac{1}{2}$ to 27, and the third from mile 28 to $49\frac{1}{2}$. The first and second sections are connected by a self-acting wire rope manipulated double way of $1\frac{1}{2}$ miles, while the second and third sections are similarly connected by another incline a mile in length.



The logging locomotive, truck, and caboose.



Stone-and-timber bridge on the line of the Cochin Forest Railway.



Elephants moving logs for shipment.



A train of timber cars. Note the density of the forest growth.

THE COCHIN FOREST RAILWAY.

State, there was little or no pretense made of administering the forests on scientific principles, with the more or less natural result that while the interior of the forest area (from which there were no facilities for transporting the cut timber) remained practically untouched, work being confined to the more accessible portions and those from which transport was easy. It was not until the year 1895 that a move for the better was made, when suggestions were made by the Resident, Sir James Thomson, which culminated, early in 1897, in the Madras government placing at the disposal of the Cochin State a British forest officer, Mr. Foulkes, for the purpose of inspecting the forests and formulating proposals for their better and more profitable administration. This gentleman's report included the recommendation that the services of a trained and experienced forest officer be obtained, and, acting in accordance with this suggestion, the Cochin Durbar obtained from the Madras government the loan of Mr. V. Alwar Chetty, T.F.S., for a period of seven years. His first care was to inaugurate a period of rest for the overworked area of timber and to set about securing a suitable outlet for the prospective output of the then virgin forests. Surveys disclosed the

Highness the Maharaja of Cochin to the Parambikolam and Nelliampatty forests in October, 1903, suggested a revision of this scheme which provided for the extension of the proposed tramway to Parambikolam, an additional $12\frac{1}{2}$ miles, the experience gained during the preceding year or two having shown conclusively that the Parambikolam River could not be relied upon to carry every year anything like a year's full yield of timber. A survey of this extension was made by Mr. Haldwell, a specially engaged engineer, in 1904.

According to the original scheme, the traction of the timber trucks was to have been by manual labor, but when the length of the proposed line amounted to 31 miles, it was recognized that manual labor would prove both too expensive and too laborious, and in September, 1904, locomotive engine traction was finally decided upon. The modifications of the original scheme already alluded to necessitated a full reconsideration of other portions of it, chiefly the proposed combined river and road transport which it was anticipated would not clear the accumulations of timber. Also in practical working it was found that a timber slide, especially in the case of lengthy and heavy logs, was unsatisfactory, and the handling of

Throughout its whole length the Cochin Forest State Railway is excellently constructed. The gage is 1 meter; the average gradient of the line 1 in 80 and the maximum gradient 1 in 25, which gradient occurs on the third of the five inclines which have been embodied in the construction.

The inclined ways are so constructed as to be self-acting, and three of them are situated in series between 21 and 23 miles and the other two between $26\frac{1}{2}$ and $28\frac{3}{4}$ miles. They are worked by means of wire cables controlled from brake houses by gear brakes independent of each other, and consisting of horizontal wheels round which the cables pass two or three times. The inclines are double railed with suitable cross-over points at the up-hill side of each brake house. The points are so arranged that a descending load, which travels down by force of gravity, requires practically no up-hill shunting, the locomotive places the truck, which on being uncoupled is then ready for the descent. In some cases, however, empty trucks going up have to be hand-shunted after being placed, in order to place them on the side of the upper incline on which the traction rope lies. The ropes are flexible and are of $1\frac{1}{2}$ inch plow steel wire. The cable

passes over a grooved pulley 6 feet diameter, after which it forms a figure 8 over a loose pulley, back again over another 6-foot pulley mounted on the same shaft as the first and thence to the other line.

On the vertical shaft on which these two pulleys are, and on which the rope binds, are mounted two horizontal drum pulleys each 6 feet diameter, $3\frac{1}{2}$ inches broad, with $\frac{1}{4}$ -inch flanges. Steel hand brakes $3\frac{1}{16}$ inch thick and 3 inches broad, studded with hard wood brake-blocks 6 inches long, can be applied to these drums by powerful linked levers controlled by hand wheels and screws, to control the speed of the load descending the incline. The grooved pulleys round which the rope binds are filled in with leather sections on end-grain, to give a good grip. The cast-iron portion of these wheels is suitably dovetailed out to contain the leather packing.

The first, second, and fourth of the five inclined ways are on curves, round which curves the wire ropes are guided by vertical rollers. On the straight portion of the inclines the cable is supported by horizontal rollers placed 30 feet apart. Illustrations of one of

sistent examination Prof. Moser has yet made. In this cave were found four such layers of clay separated by layers of ashes. While relics of the new stone-age were found in the first and second layer of ashes, in the third and fourth layers were discovered remains of the painter's mussel, land-snails, the bony scales of the swamp-turtle, and a mammal-fauna, such as the otter, beaver, goat, stag and wild bear, which manifestly point to the fact that the first cave-dwellers resorted to the fresh-water districts for their sustenance, while the later cave-dwellers found a much more generous source of nourishment along the coast. An important fact is the presence, in these oldest layers, of frequent tools, and to the same layers belong the especially interesting art objects, engravings on animal bone, described pictorially, many of them, in the Professor's report. On a polished piece of stag's horn, for instance, may be seen the rudely made drawing of a human figure that stands between two tree-trunks showing many branches. As in the set drawings of children the head is represented by a round depression, and hands and feet by silts slightly curved.

Moser cave; and very recently the Professor found a well-preserved human lower jawbone in the so-called Cave of the Bears. Sandstones, marked with grooves made by whetting the bone tools on them, prove that the caves were also the workshops of the cave-dwellers. A high degree of development is shown by the pottery; the vessels formed by a free hand are manifold not only in their form and material, but also in their decoration; one piece being marked with a broad spiral band, immediately on either side of which the depressions of the vessels are filled with white color, in which are the ears of corn and leaves of palm which ornament the band. This piece almost reminds one of the decoration of Mycenaean pottery.

Have Fishes Memory?

Studies as to the mental powers of animals have already been made on several occasions, but only recently have inquiries been made as to whether fishes have a memory or not. Results have shown traces of a memory both in coral zoophytes and other denizens of the deep. Experiments have been made with sev-



Part of the main line with empty train on a grade.
THE COCHIN FOREST RAILWAY.

these inclines are here reproduced. The rolling stock of the Cochin Forest Railway consists solely of open trucks, specially designed for carrying timber, with swiveled bolsters and chilled cast-iron wheels.

The Art of the Cave-Dweller.

A very noteworthy discovery of caves, which has brought to light a number of art objects of the oldest inhabitants, is reported by Prof. Moser in a late number of *Umschau*. In a depression, which has the appearance of a trough, of the valley extending from the Karst (Austrian) plateau, Trieste, Nabressina, Duino, to the Volnik Mountains, are found numerous caves to which leads a gate of rock under the projecting wall of the cliff. Their interiors are rooms small or spacious, which were first only places of sojourn for the Karst cave-dwellers who, originally nomads, later settled down to habitual residence in them. That the caves have served a long time as abodes is proven by the fact that in them are found frequent very thick layers of clay interstratified twice, thrice, four times, with ashes. In the latter are relics of the household. Among the caves visited the Rothgart cave, situated near the viaduct of the Southern Railway, near Nabressina, was subjected to the most per-

On a second engraved piece of bone, a jawbone, that was found in the third layer of ashes, is pictured, with a contour of almost straight lines, a wild boar of which the head is almost triangular, the tusks being clearly drawn, the eyes and ears being faintly indicated, the bristles on its back appearing with perfect distinctness, and the curl in its tail being rather indistinct. That the artist of the cave sought to reproduce the aspect of nature in which he had often seen and slain the wild boar, is shown by the high grass in which the animal stands, and which is represented by strong incisions. On a thigh-bone is easily recognized the head of a sea-turtle with eye and deeply cleft mouth; the scales and folds of the skin are indicated by easy strokes, and above the head is a sufficient hint of a fluttering dragon-fly and not far from it are tufts of reed. The two last engraved pieces of bone the Professor attributes to an early settlement in the new stone-age, while the awkward portrayal of the man may be considered as derived from the old stone-age.

While the layers of ashes contained a generous number of finely worked tools of bone and pieces of ornament, the occurrence of relics of man himself is restricted to two skeletons with additions from the

eral fishes, but the most striking results have been obtained with the gray perch, which lives chiefly on a small silvery-hued sardine. Some of these were taken and colored red, and were then put into the tank where the perch was with several other silver-colored sardines. Of course, the normal ones were at once attacked and eaten, but it was not till hungry that the perch made a tentative meal of one of the red-colored victims; on recognizing the sardine flavor, however, he promptly demolished the remainder. Subsequently the specimens in the tank devoured the sardines, irrespective of color, thus showing not only traces of a memory but also the power to differentiate color. Subsequently, sardines colored red and blue were placed in the tank together with the silver ones; the same scene was repeated, the blue ones not being attacked till the others were eaten, and hunger compelled investigation of the new comers. After this "introduction" the perch ate the sardines of all three types without any difficulty. Some spines of the sea nettle (*actinia*) were then fastened to the blue sardines; these were at once avoided by the perch, who promptly got out of the way of the new comers. This showed traces of memory, as the results of contact with the sea nettle were clearly shown and recognized.

THE NEWLY DISCOVERED GOBLIN SHARK OF JAPAN

BY DR. L. HUSSAKOF

Every now and then the zoological world is startled by the announcement of the discovery in Japanese waters of some very rare or very ancient type of animal. So often, is this the case that zoologists have come to look upon the deep waters of Japan as a sort of naturalists' wonder-land—a preserve in which live all manner of interesting animals, some of them of an archaic type long extinct in other parts of the world. The expectation of remarkable discoveries in these waters is so strong that I have heard a distinguished American zoologist, who is himself well acquainted with Japanese waters, say that he would not be greatly surprised to hear some day that a real Mosasaur or Ichthyosaur had been hooked in the depths of Kuro Shio, or warm "Black Current" of Japan.

It is in these waters that Japanese fishermen occasionally take on their lines a shark whose grotesqueness has won him among natives the name of *Tenguzame*, or goblin shark. One of these "goblins" came into the hands of President David Starr Jordan of Leland Stanford University a dozen years ago and was at once recognized as an interesting archaic type whose close relatives had long since become extinct. President Jordan described it under the name of *Mitsukurina owstoni*—the name being given to honor at the same time the late Prof. Kakichi Mitsukuri, who for a quarter of a century was the leading light of Japanese zoology, and Mr. Alan Owston, a natural history dealer of Yokohama, who was instrumental in securing the specimen. This name, by the way, does not stand at the present day, but must be replaced by *Scapanorhynchus*—a name which had previously been applied to the teeth of the extinct species of this type of shark found in the rocks of the Chalk period, in different parts of the world. In accordance with scientific usage, therefore, the Japanese shark described by President Jordan must now be known as *Scapanorhynchus owstoni*.

It is now to be recorded that a second species of goblin shark has turned up in a most unexpected way. It happened thus: All of the sharks caught in Japan in the past years and sent to the various museums—about twenty in all—were looked upon as belonging to the same species, *S. owstoni*. No one had ever thought of comparing several specimens; in fact, these sharks are so rare in museums that comparison is generally quite out of the question. It was therefore a pleasure for the writer to have had the opportunity of comparing several specimens in the collections at Columbia University and the American Museum of Natural History, and to find among them a new species of the goblin shark. This has recently been described in the Bulletin of the American Museum of Natural History as *Scapanorhynchus jordani*—the specific name being given in honor of President Jordan, our greatest authority on the fish of Japan.

Now to come to the fish himself: As seen in the illustration (Fig. 1) the new shark is certainly grotesque, well deserving his sobriquet "goblin." The largest specimen in this country is one in the National Museum at Washington, measuring over eleven feet; and the species probably attains a length of fifteen. Fortunately it is not given to frequenting the bathing-beach, but keeps to deeper waters—usually about fifty fathoms. As is generally the case with fish from deeper water, this shark is soft and pliable. Even after hardening in a preservative for several months, it can be rolled into a ball. The most remarkable feature is the curiously elongated "nose" (shown in Fig. 2). It is this, together with its protruding jaw and small beady eyes, that gives the shark that ugly

appearance. The teeth (Fig. 3) are sharp and slender, each like the pointed end of an awl. They constitute a most effective weapon, which must be fingered with discretion even on the laboratory table. As to the peculiar anatomical characters, suffice it to say that in the total make-up it is so different from all other sharks that President Jordan was at first inclined to classify the genus to which it belongs in a special family by itself.

As to the differences between the new species and the one already known, we need say only a few words.



Fig. 1.—The newly discovered goblin shark (*Scapanorhynchus jordani*).

The pictures show the differences at a glance even to the layman in matters ichthyological. The new form (lower picture) is distinguished by a much less protruding jaw, by a very much smaller spiracle (the minute accessory gill-pore seen at some distance back of the eye), and by the fact that the eye is situated opposite the middle of the jaw instead of back of it. These features are quite sufficient, in the opinion of experts, for separating our goblin as a distinct "kind." To the general reader they may perhaps be of interest as examples of the degrees of difference which are used by specialists to distinguish species of fish.

Pipe, Cigarette, and Cigar.

The question as to which of the three forms of smoking, the pipe, the cigarette, or the cigar, introduces the greatest proportion of nicotine into the smoker's system has never obtained a completely decisive answer, although it has received considerable discussion from time to time. At one time it was freely asserted that the tobacco which contained the

ter of fact, carbon monoxide is invariably found in all tobacco smoke, and that circumstance should be sufficient to warn all smokers against inhaling it persistently. Theories as to what happens in the combustion of tobacco in the various ways it is smoked next took into account the extent to which condensation products were formed and retained in the tobacco. The most effective condenser, of course, is the pipe, and there can be little doubt that owing to the length of the stem a comparatively small proportion of these condensation products reaches the mouth.

In the cigar, on the contrary, the condensing process has a tendency to travel throughout the cigar; at all events, as the cigar gets shorter the condensed product area gradually reaches the mouth and eventually the products are conveyed there by the heat of the burning end. It has been said by connoisseurs that no cigar is worth smoking after one-half of it has been consumed, which seems to be a practical realization of theoretical

considerations very suitable for application by millionaires. Again, a cigar that has been partially smoked and then allowed to go out is decidedly unpleasant when re-lit, owing doubtless to the spread of condensation products to the mouth end. In the case of the pipe, the burning area is always in the same place; it never comes near the mouth, and therefore the probability is that the condensation products do not reach the mouth in, at any rate, appreciable quantities. In the cigarette the condensation products eventually reach the mouth, but there is in this case less chance of condensation products forming since the combustion is unhampered, the tobacco being freely in contact with the air. The question of moisture, however, must not be left out in these considerations, for it is obvious that damp tobacco will form condensation products more readily than dry tobacco. It is probable, therefore, that a dry cigar or cigarette gives off less poisonous products than a damp one does, but not everyone smokes from choice a new cigar or an old cigarette. It is reasonable

to conclude that the amount of nicotine reaching the mouth does not necessarily depend on the amount in the tobacco, but on the form in which it is smoked. In drawing this conclusion regard must, of course, be had to the quantity of tobacco smoked, but if the conclusion is correct, the pipe would come first as the least harmful form of tobacco smoking, then the cigarette, and lastly the cigar.—Lancet.

It has often been remarked that the centers of seismic and volcanic activity move slowly westward. In a recent issue of the *Physikalische Zeitschrift*, H. Wehner adopts this belief and endeavors to explain the westward movement by reviving the old hypothesis of a

solid nucleus, separated by a thin stratum of liquid from the earth's crust, and rotating slightly less rapidly than the latter. According to Wehner's calculations, the nucleus makes a complete revolution, relatively to the surface of the earth, in 952 years. (There is room for a good deal of uncertainty in such calculations.) Wehner supposes, further, that the nucleus is studded with protuberances which are centers of activity and that these protuberances, coming into contact with weak parts of the earth's crust, cause earthquakes and volcanic eruptions. From this theory and the records of earthquake shocks observed by navigators of the Atlantic Ocean during the last sixty years, Wehner concludes that a group of these formidable protuberances has now arrived under the region between 1 deg. N. and 1 deg. S. latitude and 37 and 43 deg. W. longitude, and that danger is imminent in that part of the world.

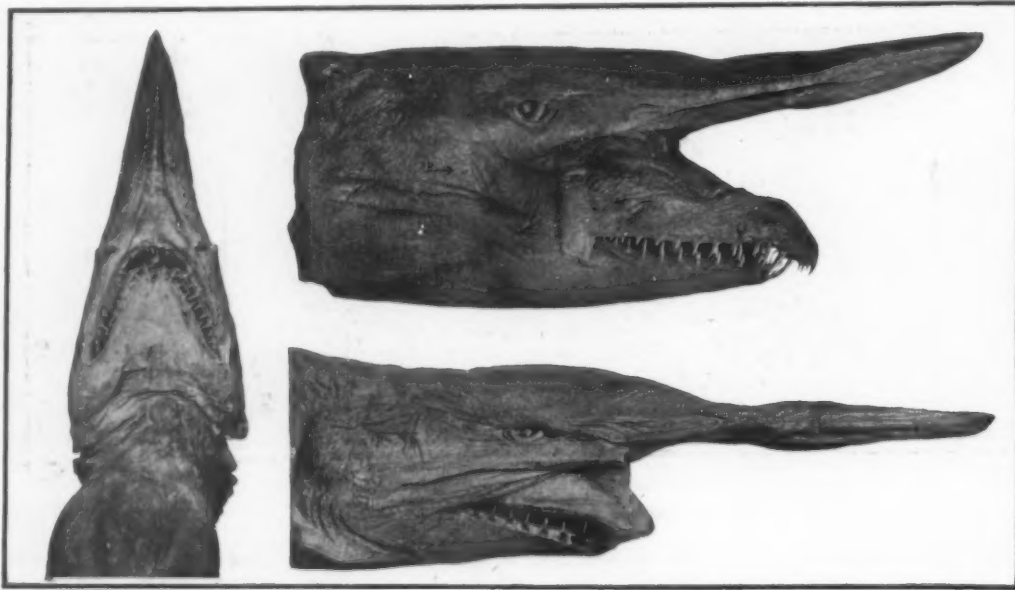


Fig. 2.—Heads of two species of goblin shark. The lower one is that of the newly discovered Jordan's goblin shark (*Scapanorhynchus jordani*).

Fig. 3.—Under side of head of Jordan's goblin shark, showing mouth and teeth.

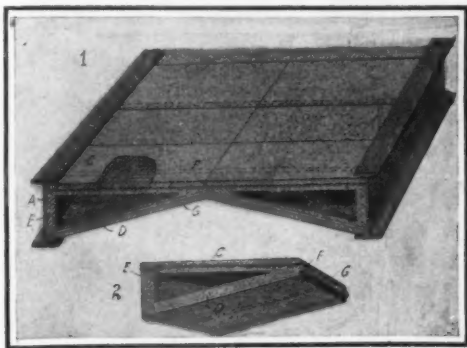
THE NEWLY DISCOVERED GOBLIN SHARK OF JAPAN.

highest amount of nicotine necessarily tended to be the most injurious, no matter in what form it was smoked, but we now know that the form of smoking plays an important part. There was a theory that not in all three cases was the original nicotine in the tobacco conveyed as such to the mouth; sometimes it was destroyed by effective combustion, while at other times pyridine was responsible for toxic effects. According to this theory, which was all on the right track, the cigarette was least harmful, because the tobacco along the thin paper wrapper was exposed freely to the air, and as a consequence the tobacco was well burnt and all nicotine was destroyed. Against this it was held that in such a case one poison disappeared only for another one to be elaborated, and carbon monoxide was found in marked quantity as a poisonous constituent of cigarette smoke. As a mat-



FIREPROOF ARCH.

Pictured in the accompanying engraving is an arch used more particularly in fireproof work, which is of very simple construction. It consists of but two tile sections, each provided with an air space usually designated as a "vacuum." The usual I-beams be-

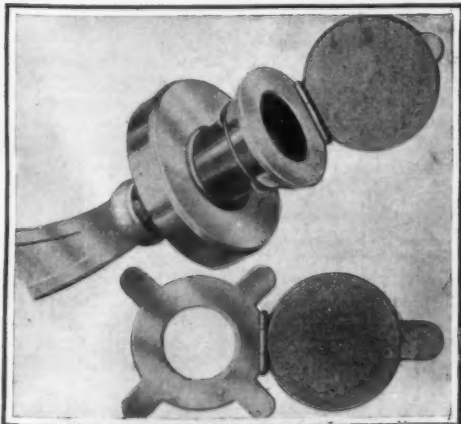


FIREPROOF ARCH.

tween which the arch is formed are indicated at A and B. Each arch member comprises a top panel C, a bottom panel D and a side panel E, thus giving the member the general shape of a wedge. At the point of the wedge one of the members is provided with a tongue F, while the other member is formed with a groove adapted to receive this tongue. When the two sections are fitted between the I-beams they are thus interlocked. A weight placed on the interlocked tiles produces an outward spreading thrust against the two I-beams A and B. To resist this thrust the I-beams are braced by means of cross rods, as indicated by dotted lines in the illustration. Our illustration shows part of the upper panel of one of the sections broken away to reveal the reinforcing, which, in this case, consists of a netting of heavy iron or steel wire imbedded within the material. The lower panel is braced by means of bars G imbedded therein which extend up into the tongue F. They take the end thrust and materially strengthen this portion of the arch. The "vacuums" or wedge-shaped air spaces formed between the panels serve to prevent undue travel of heat through the arch in case of fire. A building having a large proportion of such arches is therefore to that extent rendered more nearly fireproof than would otherwise be the case. The inventor of this arch is Mr. Eugene F. Fitzpatrick, of 153 Withers Street, Brooklyn, N. Y.

MUFFLER FOR TELEPHONE TRANSMITTERS.

Unless one is using the telephone in a booth or in a quiet room it is impossible for him to exclude all local disturbing noises by stopping the ear that is not applied to the receiver, for the reason that the noises reach him by way of the transmitter of his own instrument. In order to eliminate all such disturbing sounds a very simple device has recently been invented which may be applied to any telephone transmitter. This device is illustrated in the accompanying engraving. It is extremely simple, consisting of two members hinged together, one of them being a ring-shaped plate adapted to be placed over the mouth of the transmitter, and provided with ears which are bent back over the outside of the transmitter. A wire band is then fitted over the ears, and the latter are bent upward and hooked over the wire. Owing

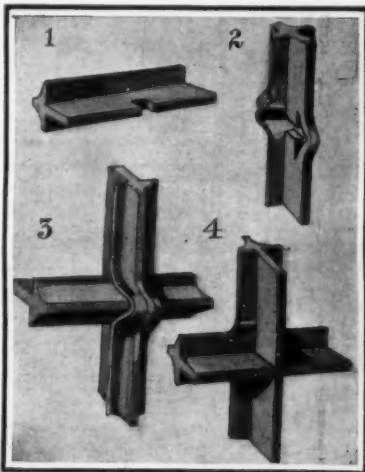


MUFFLER FOR TELEPHONE TRANSMITTERS.

to the outwardly flaring form of the transmitter the device is thus firmly made fast. Between the ring-shaped plate and the transmitter is a strip of felt which serves to prevent vibrations that strike the plate from being communicated to the mouthpiece of the transmitter. The second member, which is hinged to the plate, is in the form of a flat cover provided on the inside with a lining of felt so that when it is closed down upon the other member it will exclude all sound from the transmitter. The hinged cover is provided with a finger piece, by which it may be opened whenever one desires to use the transmitter, but at all other times it should be closed to exclude local noises. The inventor of this simple attachment for telephone transmitters is William D. Plumb, 2022 Lexington Avenue, New York city.

WROUGHT-STEEL SASHES.

In this the sanitary age we have come to recognize the importance of daylight in our work-rooms as well as in our homes. The germicidal effect of sunlight is well recognized. Add to this the fact that artificial light costs money, while sunlight is free, and nothing further need be said to demonstrate the superiority of the daylight shop, both from the sanitary and the economical point of view. Recently a new type of window sash has been devised for industrial buildings, which, it is claimed, by doing away with the cumbersome frames and heavy mullions makes it possible to deliver 25 per cent more light through a given opening than heretofore. The sash is of very simple construction, and yet is much stronger than the common wooden sash. It is better able to withstand the pressure of the wind, and furnishes no fuel to a fire. It is made of steel bars rolled to the cross section shown in the accompanying engraving. The method of joining these bars is very ingenious and decidedly unique. A small cross slot is made in the



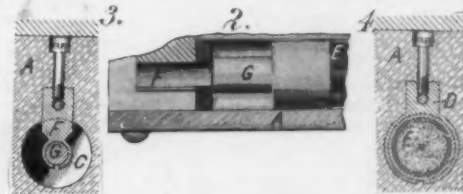
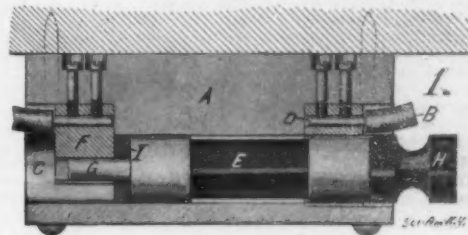
NOVEL JOINT FOR WROUGHT-STEEL SASHES.

vertical bar (Fig. 2) of the sash just large enough to admit the flange of the horizontal bar. The molded part of the vertical bar is then pressed out so as to fold closely around the molded portion of the horizontal bar, as shown in Fig. 3. In the latter bar a small notch is cut as indicated in Fig. 1 to act as a lock. It will be observed that the amount of metal removed in making this joint is infinitesimal. The bars run without break from top to bottom of the window as well as from side to side, making a particularly strong framework, and this permits of using a much lighter section than is possible with a miter joint construction, so that a great saving is effected in the weight of the material used and consequently in the ultimate cost of the sash. Furthermore, the unusual type of joint makes a break in the monotony of the window sash, which is pleasing to the eye. A patent on this type of sash has been secured by the Detroit Steel Products Company of Detroit, Mich.

SAFETY FUSE BLOCK.

Heretofore when fuses such as the screw plug, ordinary cartridge, or the open-wire type, have been used, it has been customary in making temporary installations, requiring a larger capacity than supplied by the block used in the original installation, to remove the original fuse, and to substitute therefor one of larger and in many instances of a dangerously large carrying capacity. This has resulted in permitting a load to be introduced on the wires which has taxed and in some cases broken down the insulation by heat, resulting often in producing a dangerous fire. To obviate such possibilities the fuse block illustrated in the accompanying engraving has been devised. It is so arranged as to prevent the introduction between the terminals of a line, of a fuse having a larger carrying capacity than is designed for the line. The block A as shown in

Fig. 1 is provided with a cylindrical compartment that opens at one end into a recess B, and at the other end communicates through a partition I with a recess C. Each recess is fitted with a lug adapted to receive the terminal wires of the line. The lugs are engaged by screws that pass through the blocks and serve as binding posts to hold the line wires. The lug D in the recess B is provided with spring clips of accurate form adapted to grasp the body of the fuse E. The lug F in the opposite recess is also provided with

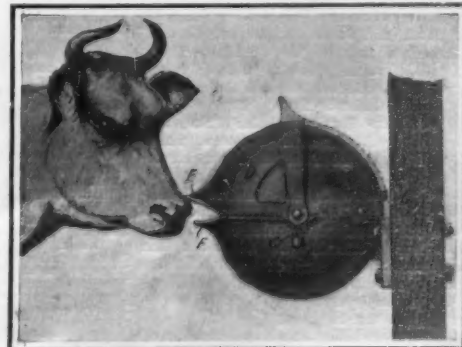


SAFETY FUSE BLOCK.

spring clips adapted to engage a boss G, which projects from the end of the fuse. The fuse is provided with the usual metallic contact bands, and one end is furnished with a handle H. All of the fuses adapted to be used with a block of a certain ampere carrying capacity are fitted with bosses of the same size. A fuse of larger carrying capacity, however, would have a boss of larger diameter. If one should attempt to insert a fuse of larger carrying capacity into the block the boss would fail to pass through the partition I and enter the clip F as shown in Fig. 2, and no contact would be made with the line terminals. The inventors of this electrical fuse block are Messrs. A. A. Moffitt and G. E. Andrews, of 40 Bridgman Street, Providence, R. I.

AUTOMATIC STOCK-SALTING DEVICE.

Cattle when housed or running free in a field need a limited supply of salt to maintain them in good condition. If the salt is placed in troughs mixed with feed some of the animals will prevent others from getting a proper amount of the salt. The accompanying engraving illustrates a device which affords free access to the stock for obtaining the requisite amount of salt and at the same time protects the salt from the elements and prevents waste. It consists of a cup-shaped receptacle which is hemispherical, as indicated at A in the illustration. A cover piece B is secured to the receptacle A by means of screws which are threaded into lugs C formed on the member B. The cover piece is also hemispherical in shape, but is cut away at the forward side to admit the muzzle of the animal. A hood D is hinged to the cover B and serves normally to close the opening in the latter. At the forward side of the hood is a lip E which projects forward and is curved upward. The receptacle A is provided with a similar lip F, which, however, is curved downward, thus leaving an opening which will expose the salt and attract the stock. In use a sufficient number of the salt holders are placed in the corral or the field where the stock range to enable the cattle to obtain the salt. The animal raises the hood by shoving his muzzle beneath the lip E and rocking the hood back until it engages a lug G. When the animal withdraws his muzzle for the salt holder the hood will close by gravity, thus protecting the salt from exposure to the elements. Messrs. Frank and Thomas L. Pelfer, of Beason, Ill. (R. F. D. No. 2), have recently secured a patent on this salting device.



AUTOMATIC STOCK-SALTING DEVICE.

RECENTLY PATENTED INVENTIONS. Pertaining to Apparel.

BELT ATTACHMENT.—E. E. Nye, Groton, N. Y. The object in this case is to provide an attachment for holding the buckle end of the belt from slipping on the trousers. Use is made of a hook adapted to engage the fastening device for connecting the front flaps of the trousers with each other, the shank of the hook terminating in a pin adapted to be fastened to the belt.

Of Interest to Farmers.

GATE.—J. W. MATTHEWS, Brady, Tex. This invention is an improvement on the former patent granted to Mr. Matthews and provides a durable farm gate which can be opened and shut from points remote from the gate itself. It is positive in operation and requires the expenditure of little effort to close or open it, the gate being operable, for example, by the occupant of a vehicle.

MILKING-MACHINE.—B. J. BIGELOW, La Crosse, Wis. An object of this invention is to provide a machine which is capable of milking cows or other animals quickly and with little effort. The device will effect the operation in a sanitary manner, thereby preventing the spread of disease which is likely to result from the unsanitary methods of the ordinary process.

Of General Interest.

ARTIFICIAL FUEL AND PROCESS FOR MAKING THE SAME.—C. F. BONHACK, New York, N. Y. This invention relates to artificial fuel, and particularly to fuels of this kind which are formed from small sizes of coal or from coal dust which is incorporated with a binder, so as to form lumps or briquets which can be conveniently burned upon a grate.

PAINT AND VARNISH REMOVER.—M. DIXIE, New York, N. Y. The improvement has reference to means for removing paint and varnish from woodwork and the like, and the object of the invention is to produce a preparation which will operate effectively to soften the varnish and paint so as to facilitate its removal as suggested.

Prime Movers and Their Accessories.

STARTING AND STOPPING DEVICE FOR GAS AND OTHER ENGINES.—T. W. ELLIS, Denton, Tex. This device for gas and other engines is for use in connection with a water supply system to provide a constant supply of water, and designed to dispense with attention except at long intervals. When the water falls below the predetermined level, a switch is operated to close the main circuit, which includes the storage battery and the motor, and as the current strengthens, the rheostat is gradually cut out. The motor drives the engine, and when the latter attains its full speed, the clutch is operated to connect it with the pump, and the motor is converted into a generator, re-charging the storage battery.

Designs.

DESIGN FOR A PLATE OR SIMILAR ARTICLE.—C. KOHN, Weiden, Bavaria, Germany. The plate is round. The outer edge and bottom of the rim are circled by a narrow band comprising leaves and berries of very small size, producing a refined, ornamental effect.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

NEW BOOKS, ETC.

THE FOURTH DIMENSION SIMPLY EXPLAINED. A collection of popular essays and editorial notes by Henry P. Manning, Ph.D., Associate Professor of Mathematics in Brown University. Illustrated. New York: Munn & Co., Inc., 1910. 12mo.; 251 pp. Price, \$1.50 net.

When the Scientific American's Prize Fourth Dimension Competition closed, the judges were astonished at the number and variety of the essays, which were received. For the most part the authors showed an excellent grasp of a very abstruse subject. Some of the essays were of such merit that to preserve them in permanent form seemed advisable. Accordingly, Professor Henry P. Manning, who was one of the judges in the competition, was entrusted with the task of selecting about twenty of the best essays, supplying them with critical notes, and furnishing an introduction. The present volume is the outcome of his labors. The volume contains not only the essays which he selected but also the essay of Lieut.-Colonel Graham Denby Fitch, which received the Five Hundred Dollar Prize, and the three honorably mentioned essays, which were published in the Scientific American together with his.

Professor Manning in his introduction dispels the notion that the fourth dimension is a mathematical delusion with which no sane man ought to occupy himself. He points out that the mathematician is not concerned with the existence or non-existence of the fourth dimension. He is simply concerned in the construction of a geometry in which there is no contradiction nor anything that is philosophically impossible.

The essays in this book are all non-mathematical or popular in their treatment. They are therefore necessarily limited in their form of presentation. By a comparison of the lower dimensional geometries the essayists derive analogies for the geometry of four dimensions, analogies so complete that the subject can be very fully explained in a non-mathematical way. The analogies are a guide even to the mathematician, but the fourth dimensional geometry does not depend upon these analogies. As a system of theorems and proofs it is built up from its axioms by a process of logical reasoning just as the lower geometries are built up.

Each of the twenty-two essays in this book is 2,500 words in length. The reading of one essay does not involve the reading of the entire work, yet the entire book gives a very good view of what the layman wishes to know about the fourth dimension. No abstract mathematics can be found anywhere in the volume. The essayists have endeavored to explain the fourth dimension both by imagining the effect of transporting an ordinary three dimensional human being into fourth dimensional space, and also by explaining a three-dimensional man's possibilities in one of two-dimensional space. The result is a collection of essays which are as interesting as any fairy tale.

Legal Notices

60 YEARS' EXPERIENCE

PATENTS

TRADE MARKS
DESIGNS
COPYRIGHTS & C.

INVENTORS are invited to communicate with
**Munn & Co., 361 Broadway, New York, or
625 F Street, Washington, D. C.** in regard
to securing valid patent protection for their
inventions. Trade-Marks and Copyrights
registered. Design Patents and Foreign
Patents secured.

A Free Opinion as to the probable patentability of an invention will be readily given to any inventor furnishing us with a model or sketch and a brief description of the device in question. All communications are strictly confidential. Our **Hand-Book on Patents** will be sent free on request.

Ours is the **Oldest** agency for securing patents; it was established over sixty-five years ago.

MUNN & CO., 361 Broadway, New York
Branch Office, 625 F St., Washington, D. C.

INDEX OF INVENTIONS

For which Letters Patent of the
United States were issued
for the Week Ending

February 15, 1910,

AND EACH BEARING THAT DATE

[See note at end of list about copies of these patents.]

Abbrading cylinder, J. E. Thomas	949,249
Adding machine, J. G. Vincent	949,338
Advertising device, Brewster & Dieckhoff	949,287
Air and gas engine, B. M. Aslakson	949,139
Air compressor, rotary, P. Peck	949,714
Air current governor, S. P. Smith	949,609
Alarm, See Burglar alarm	
Ammunition for selective shooting, H. Dorn	949,693
Amusement device, R. Farrell	949,532
Anesthetic, local, N. Sulzberger	949,134
Antiphase reversing device, W. N. Dickinson	949,465
Antiskidding device, J. F. Cooper	949,113
Arch-support, disjunctable and adjustable, W. Schmidt	949,552
Ash receptacle, O. F. Farnheimer	949,157
Astronomical apparatus, J. Z. Ruckelshaus	949,548
Autographic register, Schirmer & Stern	949,096
Automatic cleaner and polisher, F. H. Farrington	949,727
Automobile, J. E. Gable	949,422
Automobile signal, J. T. Johnson	949,453
Axle, driving, R. H. Gilbert	949,179
Axle lubricator, L. L. Arnold	949,670
Bag filling and closing machine, J. N. Crow	949,675
Balance wheel and shaft fastener, J. W. Cahill	949,645
Bailing press, R. C. Caughey	949,259
Bailing press, W. G. Merrill	949,656
Bailing press, W. W. McCullum	949,748
Bar, See furnace grate bar	
Barrel, J. Weller	949,457
Barrel, knockdown, G. K. Stitzer	949,309
Basin, wash, J. Hachter	949,396
Bath tub, P. Oliver	949,302
Batteries, rejuvenating storage, A. O. Tate	949,506
Batteries, rejuvenating storage, A. O. Tate	949,507
Battery plate, secondary, W. Morrison, re-issue	12,063
Bed, A. M. May	949,655
Bed, hammock, C. H. Young	949,135
Bed, sofa, B. Karpén	949,374
Bedstead, extension, H. B. Arnold	949,291
Beer, producing a pale chill-proof, F. H. Wagemann	949,011
Bell ringer, M. Jette et al.	949,077
Best fastener, C. O. L. Cardell	949,519
Best, power-transmission, F. W. C. Krippendorf	949,367
Belt rack, B. L. Smith	949,553
Berry stem remover, W. E. Urnschel	949,454
Beverage cooling and dispensing device, E. L. Boomer	949,211
Billiard table, N. A. A. Brucher	949,563
Binder, loose leaf, A. Benson	949,143
Binder, magazine, J. Pohoralek	949,546
Biscuits, machine for making shredded wheat, W. E. Williams	949,013
Block signal system, L. A. Hawkins	949,322
Block attachment, G. F. Geiger	949,702
Blue print machine, A. R. Murray	949,084
Board, See game board	
Bottle furnace, C. H. Wilson	949,048
Bottle rivets, scale scraper, for G. Zell	949,513
Boiler superheater, steam, Cole & Oatley	949,147
Boiler tube and flue cleaner, H. S. Stormer	949,657
Book cover, adjustable, H. Smalley	949,307
Book cover protector, B. C. McAndrews	949,128

Book support, J. E. Benjamin	949,054
Bookbinder's perforating machine, C. F. McRae	949,195
Boot and shoe edge trimming machine, A. S. Vase	949,047
Boring machine, E. G. Schillo	949,089
Boring or milling cutters, manufacturing, J. G. Matthews	949,377
Bottle and bid, F. C. Borgmeyer	949,644
Bottle coupling machine, E. Dray	949,417
Bottle capping machines, bottle rest or guide for, Nottberg & Lehmann	949,712
Bottle caps, tool for applying, Abrams & Talliferro	949,009
Bottom non-releasable, H. Corrigan	949,229
Box clamp, H. Burch	949,619
Box lid or cover, shoe polish, J. W. Davis	949,148
Bracelet, H. R. Holbrook	949,323
Brading machine, A. Orthmann	949,245
Brake, J. Burk	949,631
Brewing process, R. Kulessa	949,581
Brick drier, E. H. Callaway	949,988
Brick machine, L. M. Pratt	949,043
Broom with detachable handle, P. J. Karst	949,577
Brush, folding tooth, F. E. Kress	949,540
Brush, shaving, H. H. Belknap	949,642
Brush, tooth, R. Ludington	949,587
Building frames, etc., coupling for members for, D. J. Daly	949,394
Building purposes, machine for producing slabs for, J. C. Seelling	949,505
Bullet, C. Ross	949,028
Bundle carrier, C. S. Shaw	949,534
Burglar alarm for vaults, doors, or the like, electric, E. Seragnol	949,451
Burner, See gas burner	
Burton, J. Tamm	949,310
Butt knife, H. K. Knap	949,401
Cable trimmer, J. H. Hempen	949,149
Can body forming machine, J. E. Abrams	949,722
Can cleaning apparatus, C. H. Hood	949,121
Can heading machine, E. J. Morris	949,082
Can lighting device, C. F. Colbert	949,647
Cans or boxes, apparatus for the manufacture of sheet metal, A. W. Stoker	949,406
Canning apparatus, A. McKnight	949,710
Candy cutting machine, E. K. Knap	949,454
Cap, solder hemmed, E. M. Lang, Jr.	949,582
Car lift, J. H. Hand	949,471
Car door brackets, freight, H. Kappele	949,484
Car door, dump, S. Orie	949,494
Car feeder, A. V. Seeger	949,200
Car grain door, freight, P. S. Ratziak	949,659
Car haul, J. C. Dunlop	949,418
Car heating systems, thermostatic controller for, J. F. McElroy	949,285
Car lift, F. C. Greene	949,228
Car, pay as you enter, H. Rowntree	949,717
Car, pay within, H. Rowntree	949,131
Car replacer, W. C. Coppers	949,315
Car step, register operating, F. Langhard	949,399
Cars, wardrobe hanger for sleeping, J. A. Halderman	949,356
Carbonizing or case hardening low carbon steel, H. Rodman	949,447
Carbureting machine, automatic, J. F. Becker	949,140
Carding machine, J. J. Henderson	949,271
Cardination support, H. J. Losler	949,239
Carpet beat, H. L. Schuler	949,092
Carpet sweeper brush cleaning device, Armor & Collier	949,894
Case hardening material, H. Rodman	949,444
Case hardening or cementing material, H. Rodman	949,444
Case hardening or cementing material, H. Rodman	949,448
Cement or other liquids to stock, machine for applying liquid, A. E. Johnson	949,018
Cement beat, H. L. Schuler	949,092
Cementation by dry packing, H. Rodman	949,443
Cementation compounds, retreating, H. Rodman	949,441
Cementation or case hardening material, H. Rodman	949,440
Cementing low carbon iron, H. Rodman	949,445
Cementing material and making the same, H. Rodman	949,442
Cementing material, composition for, J. T. Norman	949,493
Centrifugal separating machine, H. M. Goodman	949,226
Centrifugal separator, H. M. Goodman	949,227
Centrifugal separator, W. B. Macklin	949,458
Centrifugal separator, W. P. Shepherd	949,003
Chair head rest, Bausch & Schell	949,300
Check book, J. Tschudi	949,099
Chemical package for, C. F. Jenkins	949,708
Chest, See tool chest	
Chuck, drill, J. W. Rhyne	949,439
Cigar moistener, J. F. Herbrich	949,430
Cigar rest, M. E. Tschudi	949,090
Cigarette machine and case, W. Downing	949,067
Circuit closer, automatic, T. W. McKenzie	949,593
Circuit wire covering pipes, connecting device for, T. E. Murray	949,243
Clacker, water heater and oil separator, W. G. Schuler	949,172
Clamp stirrup, Metzger & Moore	949,241
Clamping attachment, J. Sell	949,332
Clay ballast, device for use in producing a burnt, M. E. Tschudi	949,141
Clock, E. A. Hummel	949,705
Clock synchronizing apparatus, electric, E. A. Hummel	949,122
Clothes line hanger, safety, E. J. Eckhardt	949,700
Clothes rack, P. L. Furey	949,093
Cloth mechanism, E. J. Wilson	949,559
Coil controlled mechanism, single action, J. W. Patterson	949,438
Coke ovens, apparatus for watering coke in, A. Felder & Gorton	949,290
Collar, shirt, N. Kauffmann	949,237
Collar stuffing machine, horse, Collett & Rennie	949,293
Combining machine, Fringe, Pennington & Andrews	949,688
Combustion regulating apparatus, G. W. Parker	949,596
Commutator for dynamo-electric machines, M. W. Leachard	949,103
Composite system, O. T. Lademan	949,188
Composition of matter, F. A. Crandall	949,061
Concrete construction, reinforced, P. W. Cook	949,262
Condenser, steam, J. E. Caps	949,217
Conduit outlet, H. A. Gilbert	949,628
Container and grating device, combined, T. Whittle	949,388
Converter, variable ratio ratio, J. L. Woodbridge	949,251
Cooking utensil, P. Steger	949,453
Coolers, coil protector for, A. C. Canida	949,216
Cooling and drying materials, apparatus for, W. G. Schroder	949,719
Copper, producing electrolytic, A. S. Ramage	949,063
Corn shaker, R. Schell	949,172
Corn clamp, A. H. Stearns	949,096
Corn fastener, G. Bennett	949,142
Cornet mouthpiece, H. L. Louherr	949,021
Cotton cleaner, T. W. Felton	949,627
Coupling, See drill coupling	
Crate, metal shipping, J. A. Mayer, Sr.	949,191
Crib attachment, A. L. Almgren	949,389
Cross head, B. M. Aslakson	949,137
Cultivator, R. Olsson	949,244
Cultivator, R. Olsson	949,383
Cultivator attachment, H. Christensen	949,218
Cultivator tooth, F. E. & J. S. Bradley	949,696
Culvert, metal, C. H. Freeman	949,568
Currency cutting or shearing machine, J. I. Collier	949,402
Current motor, J. W. Myers	949,747
Curtain head, M. H. Lyons	949,126
Cutting mill, G. A. & C. T. Engle	949,016
Decanting device, P. L. Kincaid	949,019
Dental castings, apparatus for making, Carlberg & Ryan	949,291
Dental handpiece guard, C. Hinrichsen	949,273
Dental nozzle, E. S. Hodgson, Jr.	949,480
Depression portion finder, device for, for the earth's curvature and atmospheric refraction on a, Whistler & Hearn	949,458
Desk attachment, Smylie & McKelvey	949,660
Desk head, adjustable, J. Katzweyger	949,278
Display case, folding, D. Weinstein	949,340
Display frame for cards, E. Milner	949,328
Display rack, merchandise, R. D. Crego	949,393
Distance and speed indicator and recorder, U. S. Maxwell	949,000
Ditching machine, O. West	949,341
Door hanger, C. E. Frye	949,067
Door hanger, barn, W. F. Jacobs	949,076
Door lock, L. F. Roberts	949,548
Dough mixing machine, F. Seiffert	949,132
Dough or analogous material, machine for mixing and kneading, O. T. Puigg, Jr.	949,618
Dowel pin, S. C. O. Berg	949,611
Draft appliance, T. J. Dudley	949,525
Drawing roll, J. L. Sexton	949,504
Drier, W. B. Macklin	949,487
Drill coupling, rotary, L. Manna	949,390
Drill mounting, C. O. Hansen	949,427
Dross furnace, G. L. Walker	949,311
Duplicating machine, Lerner & Bean	949,480
Dust collector, F. C. Hemmer	949,593
Dye for chromed wool and making same, A. B. Oster	949,833
Dye, making a thindigo, E. Munch	949,592
Electric machine for brushing, W. Folk	949,571
Electric cut out, T. E. Murray	949,283
Electric distribution system, A. W. Gray	949,534
Electric furnace, C. A. Weeks	949,511
Electric generator and engine, combined, A. M. P. I. and B. Remy	949,634
Electric machine, dynamo, E. C. Wright	949,106
Electric machine, dynamo, H. G. Reist	949,305
Electric machine, dynamo, E. F. W. Alexander	949,345
Electric machines, brush holder for dynamo, W. T. Hensley	949,072
Electric switch, C. J. Klein	949,123
Electric switch, L. P. Coulter	949,263
Electric switch, L. P. Coulter	949,263
Electrical switch, J. D. Hillard	949,033
Elevator, P. N. Davey	949,266
Elevator apparatus, alternating current, D. Carson	949,740
Elevator-brake, W. B. Elliott	949,526
Elevator safety device, H. J. Hoy	949,274
End gate, wagon, G. W. Edson	949,566
Engine, See air and gas engine	
Engine cylinder, attachment plug for, N. M. Hopkins	949,704
Engine driven by inner combustion motor, A. Klose	949,580
Engine indicating apparatus, F. Purdy	949,129
Engine, safety apparatus for hoisting, F. Lepley	949,022
Engines, timer for internal combustion, L. C. Chowning	949,392
Envelope, safety, M. A. Evans	949,051
Excavator, A. Deay	949,254
Exhibitor, H. M. Gibson	949,569
Expanding machine, T. H. Kane	949,483
Extension table, J. J. Gruender	949,119
Face, centrifugal, F. Kestner	949,150
Faucet, mixing, Ross & Tollinger	949,044
Fence post, A. L. Roop	949,090
Fence post, B. Wise	949,206
Ferrule, making cant hook, S. Esterline	949,319
Fertilizer or cement mixing machine, C. R. Herlick	949,536
Fibrous and cellular material, indurating, L. A. Backlund	949,671
Filter, roll holder, J. H. Scotchmer	949,450
Filter, C. Hebbeler	949,357
Filtering, washing and drying apparatus, J. Bebbington	949,724
Fire alarm trap, J. Wilson	949,737
Fire escape ladder, W. A. Farmer	949,531
Firearm locking device, R. Frommer	949,467
Flash light device, A. Robbins	949,198
Flour packing machine, J. Merritt	949,440
Flue cleaner, S. S. Poole	949,495
Flue point and its attachment to flue sheets, C. S. Coleman	949,021
Fluid heating apparatus, C. W. Wellman	949,512
Fluid pressure regulating device, G. Gaslee	949,180
Folding gate, A. Battelle	949,739
Food, cattle, E. S. Davis, Jr.	949,416
Food, product and making the same, R. Summers	949,029
Foot guard, R. D. Culler	949,649
Foot handle, hay, G. Reynolds	949,089
Frame, See display frame	
Frequency generator, variable, G. Faeclod	949,320
Friction let off, J. Fuller	949,268
Fruit picker's bag, E. J. Mason	949,024
Fuel, machine for burning artificial products, Foreman & Thornton	949,176
Fuel, treating, A. G. Maul	949,326
Funnel and measure, combined, W. K. Hicks	949,074
Furnace charging apparatus, blast, R. H. Rogers	949,403
Furnace construction, S. D. Oliphant	949,402
Furnace grate bar, E. L. Thomas	949,639
Furniture clamping device, H. M. Holbrook	949,233
Furniture construction, J. Abel	949,108
Fuse for electric circuits, C. J. Dorff	949,296
Fuse plug, electric, J. H. Hanson	949,630
Game apparatus, W. F. Schelle	949,692
Game apparatus, exercising, Taylor & Bartlett	949,385
Game board, A. Schmittner	949,067
Garment fastener, H. I. Elson	949,064
Garment infanter, N. B. Tyrrell	949,163
Gas burner, Davis	949,676
Gas burner, P. J. Atzberger	949,050
Gas burner, self igniting, H. Ruppert	949,590
Gas lights, manufacture of incandescent, Curtis for, M. von Curren	949,010
Gas retort furnace, R. M. Brooke	949,674
Gas sterilizer and purifier, V. Ernsberger	949,632
Gasket for pipe joints, F. J. Randall	949,628
Gem setting, J. J. Murrin	949,657
Glass, making sheets or plates of opalite or opalescent, G. H. Harvey	



"Star" Lathes
FOR FINE, ACCURATE WORK
SENeca FALLS MFG. CO.
695 Water Street,
Seneca Falls, N. Y., U. S. A.

Engine and Foot Lathes
MACHINE SHOP OUTFITS, TOOLS AND
SUPPLIES. BEST MATERIALS. BEST
WORKMANSHIP. CATALOGUE FREE.
SEBASTIAN LATHE CO., 120 Culvert St., Cincinnati, O.

Incorporate
Your PATENTS
and BUSINESS
in ARIZONA
Laws the most liberal. Expense the least. Hold meetings, transact
business anywhere. Blanks, By-Laws and forms for making stock
full-paid for cash, property or services, free. President Standard.
FORMER SECRETARY OF ARIZONA, resident agent for
many thousand companies. Reference: Any bank in Arizona
STODDARD INCORPORATING COMPANY, Box 8000
PHOENIX, ARIZONA

Veeder Counters
to register reciprocating
movements or revolutions.
Cut full size.
Booklet Free.
VEEDER MFG. CO.
18 Sargeant St., Hartford, Conn.
Cyclometers, Odometers,
Tachometers, Counters
and Fine Counting.
Represented in Great Britain by
MARKET & CO., LONDON, 5 City
Road, Finsbury Square, London.
E. C. 3. France, by MARKET & CO.,
Lyon, 107 Avenue Parmentier,
Paris. Germany, Austria-Hungary
and Scandinavia Countries by
LEWIS LOWE & CO., Hatten-Strasse 17-20, Berlin.

SULPHIDES SEPARATION
VALUABLE DISCOVERY
E. J. Horwood, of Broken Hill, New South Wales,
Australia, has made a most successful demonstration at
the School of Mines of Bendigo, Australia, of his inven-
tion of "method of separating sulphide ores into its con-
stituents."
These tests have demonstrated that through the pre-
liminary digesting of sulphatized ores in a solution of
copper salts, such as bluestone, with or without the
addition of common salt, silver becomes unfloatable and
accompanies lead in a subsequent flotation process.

**THE REASON WHY THE
KREMENTZ**
Roller Plate
Collar Buttons
Outwear all
Others
THIS DIAGRAM ILLUSTRATES
QUANTITY OF GOLD IN
IMITATION BUTTONS
THIS ILLUSTRATES QUANTITY
OF GOLD IN THE
KREMENTZ BUTTON
At all dealers. Gold and rolled plate. Insist on the
Krementz. If damaged in any way a new one free.
Story of Collar Buttons showing shapes and sizes free.
If dealer will not supply, we will.
Krementz & Co., 77 Chestnut St., Newark, N. J.

THE "BEST" LIGHT
EVERY one is a self-con-
tained miniature light
works. 100 to 2000 candle
power. Costs less than
kerosene.
Absolutely safe
Very brilliant
Powerful
And steady.
Every lamp warranted.
Over 20 styles.
Agents wanted. Catalog
free. Write to-day.
The Best Light Co.,
87 E. 5th St.,
Canton, O.
MAKES
AND BURNS
ITS OWN
GAS

FRICITION DISK DRILL
FOR LIGHT WORK.
Has These Great Advantages:
The speed can be instantly changed from 0 to 1600 without
stopping or shifting belts. Power applied can be graduated
to drive, with equal safety, the smallest or largest drills
within its range—a wonderful economy in time and great
saving in drill breakage. 128 Send for Drill Catalogue.
W. F. & JNO. BARNES CO.,
Established 1870.
1099 Ruby Street, Rockford, Ill.

VEHICLES OF THE AIR
By V. LOUGHEED
A Popular Exposition of Modern Aeronautics with
Working Drawings. The most complete book published
on aerial navigation. 479 pages, 65 x 9 1/2 inches, 270 il-
lustrations, including working drawings of machines
and parts. Price \$2.75 postpaid. Send for a de-
scriptive circular.
MUNN & COMPANY, Inc., 361 Broadway, New York City

ARITHMETIC
SELF-TAUGHT
A plain, easily-understood volume for
ALL who have not had the opportu-
nity of learning this subject thor-
oughly, or who have forgotten what
they once learned.
267 Pages. Requires No Teacher.
This great little book
sent postpaid for \$1.00.
(money refunded) leather binding, \$1.50.
GEO. A. ZELLER BOOK CO.
Box 1070, 424 W. Belle Pl., St. Louis, MO.

GROBET
Swiss Files
and other tools shown
in "The Tool-Monger."
Sent free if you mention this paper when writing.
MONTGOMERY & CO., 109 Fulton Street, New York City

Iron refining furnace, Hawkins & Key	949,475
Ironing board, C. E. Call	949,646
Jack locking device, Bates & Fride	949,351
Junction box, W. J. Graham	949,460
Keg, powder, L. B. Eaton	949,428
Knife edge bearing, A. Sonander	949,395
Knit fabric, machine for knitting, G. Keyser	949,094
Knitting machines, looping device for, J. W. Latcher	949,280
Knot tying machine, J. C. Anderson	949,378
Labeling machine, bottle, P. N. Young	949,408
Ladder, extension, H. Epstein	949,367
Ladder rungs and the like, support and brace for, F. C. Myer	949,529
Ladder, step, W. J. Blundell	949,194
Lamp, acetylene gas generating, J. Bleser	949,333
Lamp, arc, J. T. H. Dempster	949,353
Lamp circuit, vapor electric, P. H. Thomas	949,335
Lamp cleaner, electric, E. E. Edgerton	949,419
Lamp, electric arc, J. C. Lincoln	949,081
Lamp, incandescent gas, G. Baap	949,151
Lamp, metallic filament incandescent, W. Majert	949,547
Lamp, miner's, Davis & Monteith	949,153
Lamp socket, electric, R. B. Stoddard	949,318
Lamp socket, electric, R. B. Stoddard	949,318
Lamp socket, incandescent, W. H. Perkins	949,303
Lamp socket, incandescent electric, D. E. Bowa	949,303
Lantern, brass holder mechanism for, W. C. Braun	949,517
Last support and last unlocking device, combined, G. G. Schelter	949,100
Latch, door, C. Smith	949,405
Latch for door hangers, H. C. Consey	949,221
Lawn sprinkler, G. H. Choate	949,520
Ledger, self indexing, A. J. Achter	949,514
Leg spreader, C. Freund	949,118
Lens holder, J. M. Chappel	949,413
Lifter, See pan-lifter	
Lifting jack, multiple, A. H. Schelle	949,331
Lighting arrester, G. W. Clark	949,345
Lighting arrester, pole line, A. B. Rbeln- berger	949,180
Line check, W. B. Fowler	949,177
Liquid into vessels through a closed cham- ber by an adjustable nozzle, means for introducing, J. A. Hicks	949,479
Lock, S. N. Rader	949,409
Lock, C. A. Berry	949,613
Locomotive ash pan, H. A. Hoke	949,017
Locomotive ash-pit, O. Spaeth	949,162
Locomotive, electric, E. F. W. Alexanderson	949,347
Loom, J. E. Goodwin	949,629
Loom dobbie, Kuttruff & Frefel	949,238
Loom rack adjustment, S. Kendrick	949,579
Loom shuttle box motion, A. A. Jordan, Jr.	949,565
Loom stop motion, P. B. Frost	949,395
Looms, web carrier for needle, J. P. Humphries	949,706
Lumber register, R. H. Mellow	949,127
Magnet for dynamo electric machines, field, E. Matman	949,082
Mail box support, H. J. Hanson	949,231
Mail marking machine, F. C. Hilde	949,275
Manure spreader and holder, G. E. Hulse	949,305
Manure spreader frame, F. Schaal	949,001
Manure spreaders, drill attachment for, C. H. Ellis	949,173
Massage apparatus, M. A. Haines	949,230
Massage apparatus, J. Sabatino	949,550
Match box holder, H. C. Kirk	949,185
Match case, B. Epstein	949,528
Match receptacle, cigar cutting, J. P. Croschwald	949,524
Matchsafe, J. L. Dunning	949,223
Measurement gage, outside or inside, C. E. Johansson	949,276
Measuring device, foot, J. H. Waite	949,289
Meat compound, preparing a preserved, H. Toth	949,336
Meat press, E. M. Johnson	949,234
Meat slicer and cutter, combined, J. Winkel- meyer	949,344
Medical instrument, M. J. Rogers	949,382
Metals from solutions, electrolytic apparatus for recovering, W. A. Hendryx	949,016
Meter testing device, H. P. Westcott	949,640
Milk and cream purifying apparatus, J. H. Curran	949,385
Mill, See Cutting mill	
Minerals, separation of combined, A. S. Ramage	949,002
Miter box, W. Turner	949,101
Mixing machine, P. A. Koehring	949,900
Mixing machine, A. J. Cropp	949,698
Mold, J. A. Rathbone	949,490
Mold filling machine, J. A. Rathbone	949,745
Molding apparatus, J. A. Rathbone	949,497
Mop, J. D. Keeney	949,679
Mosquito bar support, A. F. Chastant	949,620
Motor control, single-phase, E. F. W. Alex- anderson	949,346
Motor control system, E. W. Stull	949,007
Motor control system, electric, W. Cooper	949,114
Motors and receptacles, support for, J. C. Neuschwander	949,197
Mount trimming machine, C. H. Gault	949,130
Musical instruments, valve for pneumatic, G. S. Williams	949,250
Muzzle and calf weaner, W. H. Lyman	949,730
Nail or spike puller, G. W. Troquer	949,337
Necktie, C. Beynon	949,396
Nest for poultry, recording, G. A. L. Argles	949,610
Nozzle, J. G. Mastlin	949,489
Nursing attachment, H. B. Cunningham	949,414
Nut lock, H. Bett	949,412
Nut lock, Davidson & Mandlin	949,624
Nut lock, C. D. Loehr	949,741
Oil burner, C. H. Herff	949,073
Oil burner, Cowan & Felten	949,048
Oil burner, crude, F. D. Stalford	949,573
Oil gun, Molinari & Laurent	949,193
Open hearth furnace, S. E. Meyers	949,192
One sampling apparatus, A. J. McConne	949,284
One separator, G. V. Kuehl	949,700
Oron, modulating line, J. Weatherly, Jr.	949,357
Oscillating motor, G. Hager	949,372
Pan, P. C. Howland	949,904
Pan and plate lifter, G. C. Depper	949,650
Pan lifter, D. O. A. B. Henry	949,573
Paper bag machine, W. C. Fuller	949,408
Paper bottle, C. F. Jenkins	949,036
Partitions, sanitary base for, G. C. Mason	949,589
Paste tube, F. Muller	949,545
Pen, fountain, W. E. Geyser	949,425
Pencil holder, J. W. Mills	949,501
Pencil sharpener, D. L. McBride	949,085
Photographic printing frame, D. J. Lind- say	949,125
Pianos, action for pneumatic player, Berg- lund & Webb	949,612
Piling, metal, J. J. Harold	949,473
Pin, See Dowel pin	
Pipe cleaner, G. Cragin	949,622
Pipe coupling, F. C. Pahlow	949,329
Pipe coupling, train, H. W. Thomas	949,446
Pipe hanger, R. C. Hunter	949,570
Pipe threading tools, work holder for, B. Borden	949,031
Pipe wrench, J. F. Wright	949,107
Pipe wrench, S. A. Whetzel	949,557
Piston ring, W. A. Reinhardt	949,690
Plane guide, W. E. Whitway	949,001
Plant stand, adjustable, J. M. Hama	949,535
Planter seedling attachment, J. L. Baldwin	949,254
Plastic material mold, G. A. Harter	949,571
Plate or dish, child's, J. C. Matthews	949,492
Plow, J. H. Nicholas	949,617
Plow, J. G. Redmond	949,686
Plow, J. R. Rossetter	949,688
Plow harrow attachment, A. L. Luce	949,039
Plowshare, G. J. Buckley	949,617
Pneumatic cleaner, A. C. Buell	949,370
Pocket guard, A. J. Bellah	949,073
Polish device, B. M. Schumann	949,045
Powder and other substances, instrument for administering, L. J. F. Nicolai	949,202
Power transmission device, G. A. Cutter	949,263
Pressure gage, differential, B. J. P. Roberts	949,508
Primary battery, W. C. Banks	949,256
Printing machine sheet feeding device, G. Klein, re-issue	18,002

The Car That Captured The Country

The Overland—as some of you know—is the greatest sensation in motordom. In two years the demand has grown from almost nothing to 20,000 cars—our orders for the present year. All without advertising—solely because there was never a car that compared with the Overland.

An Enticing Story

Every man should know of the Overland. For here is a story of quick success such as never before has been written.

A story of a man—Mr. John N. Willys—who took a bankrupt concern whose only asset was a car created by a mechanical genius. And, because of this wonderful car built the sales in two years to a monthly sale exceeding \$2,000,000.

How he operates four factories—employs 4,000 men—ships 30 carloads of automobiles per day—to supply the call for Overlands.

You don't know the best about motor cars until you know the car which—in two years' time—has captured a large share of the whole trade of the country.

Simplicity

The key to the Overland's astounding success has been largely simplicity. For the early Overlands—when the output was small—were not such bargains as now.

A ten-year old child in five minutes can master an Overland car. It is all done by pedal control. An amateur can run one—the first time he tries it—from Chicago to the Pacific.

Never was a car so simple, so staunch, so easy to keep in order. And never was a car—within range of the price—so large, so attractive, so powerful.

One Overland car has, again and again, sold from 15 to 30 others. The 4,000 Overlands sold last year brought us orders for this year—before the year opened—for 20,000 cars.

Cost Cut 20 Per Cent

This tremendous production has cut the cost of Overlands 20 per cent. Overland Model 38 sells for \$1,000 now. It is considerably better than the \$1,250 Overland last year. Power, 25 horsepower—speed, 50 miles an hour.

A 40 horsepower Overland this year sells for \$1,250. And for \$1,500—in the Overland—one gets the equal of any \$3,000 car.

No other maker attempts to give what the Overland gives for the money. For no other maker turns out daily—as we do—125 standardized cars.

And the price of each Overland includes lamps and magneto—a car all ready to run.

Get the Whole Story

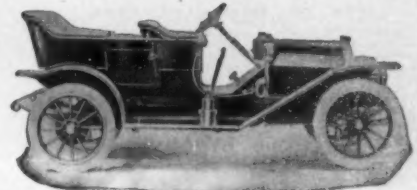
All this wonderful story is told in a book. Send me this coupon for it. You can't know the best about automobiles until you know this remarkable car.

F. A. BARKER, Sales Manager,
THE WILLYS-OVERLAND COMPANY,
TOLEDO, OHIO
Licensed Under Patent

Please send me the book.

The
Overland

Made in
Six Styles of Body



"CASTELL"
DRAWING, COPYING AND INK PENCILS
are the finest productions of a house that has been manufacturing the highest grade lead pencils for 110 years and has earned a reputation for excellence that has made the name of
A. W. FABER
famous all the world over. Sold by all stationers and dealers in artists' and drawing materials. Sample will be sent you on receipt of 10c.
A. W. FABER, 49 Dickerson Street, Newark, New Jersey

A HANDY LITTLE TOOL
is our Hule Clamp No. 20 used to clamp two steel rules together—and to end-in extension. Rules may be of same or different widths up to 24 inches. Of special value to mechanics having tool chests smaller than 12 inches.
Price 50c. a pair
Send for 200 page catalog No. 15-B.
THE L. S. STARRETT CO., Athol, Mass., U. S. A.

SENSITIVE LABORATORY BALANCE
By N. Monroe Hopkins. This "built-up" laboratory balance will weigh up to one pound and will turn with a quarter of a postage stamp. The balance can be made by any amateur skilled in the use of tools, and it will work as well as a \$125 balance. The article is accompanied by detailed working drawings showing various stages of the work. This article is contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 1184. Price 10 cents. For sale by MUNN & CO., Inc., 361 Broadway, New York City or any bookseller or newsdealer.

ELECTRO MOTOR, SIMPLE, HOW TO MAKE.—By G. M. Hopkins. Description of a small electric motor devised and constructed with a view to assisting amateurs to make a motor which might be driven with advantage by a current derived from a battery, and which would have sufficient power to operate a foot lathe or any machine requiring not over one man power. With 11 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 641. Price 10 cents. To be had at this office and from all newsdealers.

Don't Throw It Away—Does Your Graniteware or Hot Water Bag Leak? **USE MENDETS**
They mend all leaks in all vitreous—tin, brass, copper, graniteware, hot water bags, etc. Noncinder, cement or rivet. Any one can use them; fit any surface; two million in use. Send for sample pack, 10c. Complete list, assorted sizes, 25c. postpaid. Agents wanted. Collette Mfg. Co., Box 192, Amsterdam, N. Y.



Special Easter Cruise

LEAVING THURSDAY, MARCH 24TH

Could Any Trip Be Better Chosen Than to BERMUDA, ST. THOMAS, SAN JUAN and HAVANA?

Returning Saturday, April 9th. Two weeks of delightful travel on the superb twin screw steamship MOLTKE (12,500 tons), with all modern safety appliances and comforts of a first-class hotel. Ample Time Ashore for Sightseeing. \$85.00 up.

Also Summer Cruises to Norway, Spitzbergen, Iceland, Etc.

We as originators of pleasure cruising have developed our cruises to the highest state of perfection through practical experience of over 20 years.

WRITE FOR TRAVEL BOOKS

Hamburg-American Line, 41-45 Broadway, N. Y.
Boston Philadelphia Chicago St. Louis San Francisco

RECENTLY PATENTED INVENTIONS.

Pertaining to Apparel.

BELT ATTACHMENT.—E. E. Nye, Gorton, N. Y. The object in this case is to provide an attachment for holding the buckle end of the belt from slipping on the trousers. The same is made of a hook adapted to engage the fastening device for connecting the front flaps of the trousers with each other, the shank of the hook terminating in a pin adapted to be fastened to the belt.

Of Interest to Farmers.

GATE.—J. W. Matthews, Brady, Tex. This invention is an improvement on the former patent granted to Mr. Matthews and provides a durable farm gate which can be opened and shut from points remote from the gate itself. It is positive in operation and requires the expenditure of little effort to close or open it, the gate being operable, for example, by the occupant of a vehicle.

MILKING MACHINE.—B. J. Bigelow, La Crosse, Wis. An object of this invention is to provide a machine which is capable of milking cows or other animals quickly and with little effort. The device will effect the operation in a sanitary manner, thereby preventing the spread of disease which is likely to result from the unsanitary methods of the ordinary process.

Of General Interest.

ARTIFICIAL FUEL AND PROCESS FOR MAKING THE SAME.—C. F. Bonhack, New York, N. Y. This invention relates to artificial fuel, and particularly to fuels of this kind which are formed from small sizes of coal or from coal dust which is incorporated with a binder, so as to form lumps or briquets which can be conveniently burned upon a grate.

PAINT AND VARNISH REMOVER.—M. Dake, New York, N. Y. The improvement has reference to means for removing paint and varnish from woodwork and the like, and the object of the invention is to produce a preparation which will operate effectively to soften the varnish and paint so as to facilitate its removal as suggested.

Prime Movers and Their Accessories.

STARTING AND STOPPING DEVICE FOR GAS AND OTHER ENGINES.—T. W. Ellis, Denison, Tex. This device for gas and other engines is for use in connection with a water supply system to provide a constant supply of water, and designed to dispense with attention except at long intervals. When the water falls below the predetermined level, a switch is operated to close the main circuit, which includes the storage battery and the motor, and as the current strengthens, the rheostat is gradually cut out. The motor drives the engine, and when the latter attains its full speed, the clutch is operated to connect it with the pump, and the motor is converted into a generator, re-charging the storage battery.

Designs.

DESIGN FOR A PLATE OR SIMILAR ARTICLE.—C. Kersch, Weiden, Bavaria, Germany. The plate is round. The outer edge and bottom of the rim are circled by a narrow band comprising leaves and berries of very small size, producing a refined, ornamental effect.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

NEW BOOKS, ETC.

THE FOURTH DIMENSION SIMPLY EXPLAINED. A collection of popular essays and editorial notes by Henry P. Manning, Ph.D., Associate Professor of Mathematics in Brown University. Illustrated. New York: Munn & Co., Inc., 1910. 12mo.; 251 pp. Price, \$1.50 net.

When the Scientific American's Prize Fourth Dimension Competition closed, the judges were astonished at the number and variety of the essays, which were received. For the most part the authors showed an excellent grasp of a very abstruse subject. Some of the essays were of such merit that to preserve them in permanent form seemed advisable. Accordingly, Professor Henry P. Manning, who was one of the judges in the competition, was entrusted with the task of selecting about twenty of the best essays, supplying them with critical notes, and furnishing an introduction. The present volume is the outcome of his labors. The volume contains not only the essays which he selected but also the essay of Lieut.-Colonel Graham Denby Fitch, which received the Five Hundred Dollar Prize, and the three honorably mentioned essays, which were published in the Scientific American together with his.

Professor Manning in his introduction dispels the notion that the fourth dimension is a mathematical delusion with which no sane man ought to occupy himself. He points out that the mathematician is not concerned with the existence or non-existence of the fourth dimension. He is simply concerned in the construction of a geometry in which there is no contradiction nor anything that is philosophically impossible.

The essays in this book are all non-mathematical or popular in their treatment. They are therefore necessarily limited in their form of presentation. By a comparison of the lower dimensional geometries the essayists derive analogies for the geometry of four dimensions, analogies so complete that the subject can be very fully explained in a non-mathematical way. The analogies are a guide even to the mathematician, but the fourth dimensional geometry does not depend upon these analogies. As a system of theorems and proofs it is built up from its axioms by a process of logical reasoning just as the lower geometries are built up.

Each of the twenty-two essays in this book is 2,500 words in length. The reading of one essay does not involve the reading of the entire work, yet the entire book gives a very good view of what the layman wishes to know about the fourth dimension. No abstract mathematics can be found anywhere in the volume. The essayists have endeavored to explain the fourth dimension both by imagining the effect of transporting an ordinary three-dimensional human being into fourth dimensional space, and also by explaining a three-dimensional man's possibilities in one of two-dimensional space. The result is a collection of essays which are as interesting as any fairy tale.

Legal Notices

60 YEARS' EXPERIENCE

PATENTS

TRADE MARKS

DESIGNS

COPYRIGHTS & C.

INVENTORS are invited to communicate with Munn & Co., 361 Broadway, New York, or 625 F Street, Washington, D.C., in regard to securing valid patent protection for their inventions. Trade-Marks and Copyrights registered. Design Patents and Foreign Patents secured.

A Free Opinion as to the probable patentability of an invention will be readily given to any inventor furnishing us with a model or sketch and a brief description of the device in question. All communications are strictly confidential. Our Hand-Book on Patents will be sent free on request.

Ours is the Oldest Agency for securing patents; it was established over sixty-five years ago.

MUNN & CO., 361 Broadway, New York

Branch Office, 625 F St., Washington, D. C.

INDEX OF INVENTIONS

For which Letters Patent of the United States were issued for the Week Ending

February 15, 1910,

AND EACH BEARING THAT DATE

[See note at end of list about copies of these patents.]

Abbrading cylinder, J. R. Thomas.....	949,249
Adding machine, J. G. Vincent.....	949,238
Advertising device, Perew & Dischinger.....	949,287
Amusement device, R. Farrell.....	949,128
Air compressor, rotary, P. Peck.....	949,714
Air current governor, S. P. Smith.....	949,009
Alarm, See Burglar alarm.....	
Ammunition for selective shooting, H. Dorn.....	949,063
Amusement device, R. Farrell.....	949,128
Anesthetic, local, N. Sulzberger.....	949,134
Antiplane reversing device, W. N. Dickinson, Jr.....	949,465
Antiskidding device, J. F. Farrell.....	949,113
Arch-support, disjunctable and adjustable.....	949,352
Ash receptacle, O. Partenheimer.....	949,157
Astronomical apparatus, G. J. Baker.....	949,348
Axle, driving, B. H. Gilbert.....	949,129
Automatic cleaner and polisher, F. H. Farington.....	949,727
Automobile, J. E. Gable.....	949,422
Automobile signal, J. T. Johnson.....	949,423
Axle, driving, B. H. Gilbert.....	949,129
Axle lubricator, L. L. Arnold.....	949,670
Bag filling and closing machine, J. N. Crowley.....	949,675
Balance wheel and shaft fastener, J. W. Cahill.....	949,645
Bailing press, R. C. Caughey.....	949,650
Bailing press, W. G. Merrill.....	949,656
Bailing press, W. W. McCallum.....	949,748
Bar, See Furnace grate bar.....	
Barrel, J. Wollner.....	949,457
Barrel, knockdown, G. K. Stitzer.....	949,309
Bath tub, J. Oliver.....	949,306
Bath tub, J. Oliver.....	949,306
Batteries, rejuvenating storage, A. O. Tate.....	949,507
Battery plate, secondary, W. Morrison, re-issued.....	15,063
Bed, A. M. May.....	949,055
Bed, hammock, C. H. Young.....	949,135
Bed, sofa, S. Karpen.....	949,374
Bedstead, extension, H. B. Arnold.....	949,291
Beer, producing a pale chaff-proof, F. H. Wagemann.....	949,011
Bell ringer, M. Jett et al.....	949,077
Belt fastener, C. O. L. Cardell.....	949,519
Belt, power-transmission, P. F. W. C. Krippendorf.....	949,124
Belt rack, B. L. Smith.....	949,553
Berry stem remover, W. E. Urschel.....	949,454
Beverage cooling and dispensing device, E. L. Boerner.....	949,211
Billiard table, K. A. A. Brachet.....	949,563
Binder, loose leaf, A. Benson.....	949,513
Binder, magazine, J. Pohorsky.....	949,546
Biscuits, machine for making shredded wheat, W. E. Williams.....	949,013
Block signal system, L. A. Hawkins.....	949,322
Blotter attachment, G. F. Geiger.....	949,702
Blue print machine, A. R. Murray.....	949,084
Board, See game board.....	
Boiler furnace, C. H. Wilson.....	949,048
Boiler furnace, waste scraper for, G. Zein.....	949,513
Boiler superheater, steam, Cole & Oatley.....	949,147
Boiler tube and flue cleaner, H. S. Storer.....	949,637
Book cover, adjustable, W. H. Smalley.....	949,307
Book cover protector, B. C. McAndrews.....	949,128

Book support, J. E. Benjamin.....	949,054	Display frame for cards, E. Milner.....	949,323
Bookholder's perforating machine, C. F. McRae.....	949,195	Display rack, merchandise, R. D. Cressy.....	949,393
Boot and shoe edge trimming machine, A. S. Boring.....	949,105	Distance and speed indicator and recorder, G. S. Maxwell.....	949,000
Boring machine, E. G. Schillo.....	949,689	Ditching machine, O. West.....	949,341
Boring or milling cutters, manufacturing, J. G. Matthews.....	949,377	Door hanger, C. E. Frye.....	949,067
Bottle and lid, F. C. Borgmeyer.....	949,044	Door hanger, barn, W. F. Jacobs.....	949,076
Bottle capping machine, E. Decker.....	949,417	Door lock, L. F. Roberts.....	949,548
Bottle capping machine, bottle rest or guide for, Nottberg & Lehmann.....	949,712	Dough mixing machine, F. Seiffert.....	949,132
Bottle caps, tool for applying, Abrams & Tallaferra.....	949,069	Dough or analogous material, machine for mixing and kneading, O. T. Buss, Jr.....	949,618
Bottle, non-regulating H. Overgaa.....	949,220	Dowel pin, S. C. O. Berg.....	949,611
Box clamp, H. Burch.....	949,619	Draft appliance, T. J. Dudley.....	949,525
Box lid or cover, shoe polish, J. W. Davis.....	949,148	Drawing roll, J. L. Sexton.....	949,504
Bracelet, H. R. Holbrook.....	949,323	Drop, W. R. Mackling.....	949,487
Braiding machine, A. Orthmann.....	949,245	Drill coupling, rotary, L. Massa.....	949,300
Brake, J. Hark.....	949,551	Drill mounting, C. O. Hansen.....	949,427
Brewing process, R. Kubessa.....	949,581	Dross furnace, G. L. Walker.....	949,311
Brick drier, E. H. Callaway.....	949,088	Duplicating machine, Lerner & Bean.....	949,486
Brick machine, L. M. Pratt.....	949,043	Dust collector, F. C. Hemmer.....	949,093
Brick, folding tooth, F. E. Gray.....	949,540	Dye for chromed wool and making same, Azo, H. Oster.....	949,633
Brush, folding tooth, F. E. Gray.....	949,540	Dye, making a thindigo, E. Munch.....	949,592
Brush, shaving, H. H. Belknap.....	949,642	Earthenware, machine for brushing, W. Polk.....	949,381
Brush, tooth, B. Ludington.....	949,587	Electric cut out, T. E. Murray.....	949,283
Building frames, etc., coupling for members for, D. J. Greene.....	949,394	Electric distribution system, A. W. Gray.....	949,534
Building purposes, machine for producing slabs for, J. C. Snelling.....	949,505	Electric furnace, C. A. Weeks.....	949,511
Bullet, C. Ross.....	949,028	Electric generator and engine, combined for, F. I. and B. P. Remy.....	949,634
Burglar carrier, C. S. Sharp.....	949,534	Electric machine, dynamo, E. C. Wright.....	949,106
Burglar alarm for vaults, safes, or the like electric, E. Seragnol.....	949,451	Electric machine, dynamo, H. G. Reist.....	949,305
Burner, See gas burner.....		Electric machine, dynamo, E. F. W. Alexander.....	949,345
Button, J. Tams.....	949,310	Electric machines, brush holder for dynamo, W. T. Henkle.....	949,072
Cake trimmer, J. H. Hemen.....	949,149	Electric switch, C. J. Klein.....	949,123
Can body forming machine, J. E. Abrams.....	949,722	Electric switch, L. P. Coulter.....	949,263
Can cleaning apparatus, C. H. Hood.....	949,121	Electrical controller, P. L. Sessions.....	949,333
Can heading machine, E. J. Morris.....	949,682	Electrical switch, J. D. Hilliard.....	949,033
Can righting device, C. F. Colbert.....	949,647	Elevator, P. N. Davey.....	949,296
Cans or boxes, apparatus for the manufacture of sheet metal, A. W. Stoker.....	949,406	Elevator apparatus, alternating current, D. Larson.....	949,740
Canning apparatus, A. McKeel.....	949,710	Elevator safety device, H. J. Hoy.....	949,274
Candy cutting machine, E. R. Kevie, Arno.....	949,454	End gate, wagon, G. W. Edson.....	949,506
Cap, solder heated, E. M. Lang, Jr.....	949,382	Engine, See air and gas engine.....	
Car brake, J. H. Hand.....	949,471	Engine cylinders, attachment plug for, N. H. Hopkins.....	949,704
Car door brackets, freight, H. Kappele.....	949,484	Engine driven by inner combustion motor, A. Klose.....	949,580
Car door, dump, S. Otis.....	949,494	Engine indicating apparatus, F. Purdy.....	949,129
Car feeder, A. C. Seeger.....	949,500	Engines, safety apparatus for holding, L. Lepley.....	949,022
Car grain door, freight, P. S. Batziad.....	949,659	Engines, timer for internal combustion, L. C. Chowning.....	949,392
Car, hand, J. C. Dunlop.....	949,418	Envelope, safety, M. A. Evans.....	949,451
Car heating systems, thermostatic controller for, J. F. McElroy.....	949,285	Excavator, W. E. Elliott.....	949,539
Car lift, F. C. Greene.....	949,228	Exhibitor, H. M. Gibson.....	949,569
Car, pay as you enter, H. Rowntree.....	949,717	Expanding machine, T. H. Kane.....	949,483
Car, pay within, H. Rowntree.....	949,131	Extension table, J. J. Gruender.....	949,119
Car replacer, W. S. Coppers.....	949,315	Fan, centrifugal, J. Kestner.....	949,150
Car seat, register-operating, F. Langham.....	949,299	Faucet, draining, Ross & Tollinger.....	949,044
Cars, wardrobe hanger for sleeping, J. A. Halderman.....	949,356	Fence post, A. L. Roop.....	949,060
Carbonizing or case hardening low carbon steel, H. Rodman.....	949,347	Fence post, B. Wise.....	949,206
Carbonizing or case hardening material, H. Becker.....	949,140	Fence post mold or form, A. L. Roop.....	949,061
Carding machine, J. J. Henderson.....	949,271	Fertilizer, making cast, S. Entering.....	949,519
Carnation support, H. J. Loxley.....	949,239	Fertilizer or cement mixing machine, C. B. Herrick.....	949,536
Carpet beater, H. L. Schuler.....	949,092	Fibrous and cellular material, insulating, L. H. Haeckel.....	949,671
Carpet sweeper brush, J. J. Collier.....	949,604	File roller holder, J. H. Seitchner.....	949,357
Case hardening material, H. Rodman.....	949,446	Filtering, washing and drying apparatus, J. Rebbington.....	949,724
Case hardening or cementing, H. Rodman.....	949,444	Fire alarm, J. J. Wilson.....	949,731
Case hardening or cementing material, H. Rodman.....	949,448	Fire escape ladder, W. A. Farmer.....	949,531
Cement or other liquids to stock, machine for applying liquid, A. E. Johnson.....	949,018	Firearm locking device, R. Frommer.....	949,467
Cement past, M. C. Nolte.....	949,594	Flash light device, A. Robbins.....	949,198
Cementation by dry carbonizing, G. W. Cementation compounds, retreating, H. Rodman.....	949,443	Flour packing machine, J. Merritt.....	949,246
Cementation or case hardening material, H. Rodman.....	949,441	Flour, cleaner, S. S. Foster.....	949,485
Cementing low carbon steel, H. Rodman.....	949,449	Flue point and its attachment to flue sheets, C. S. Coleman.....	949,621
Cementing material and making the same, H. Rodman.....	949,445	Fluid heating apparatus, C. W. Wellman.....	949,512
Cementing or joining material or articles, composition for, J. Norman.....	949,463	Fluid pressure regulating device, G. S. Gage.....	949,180
Centrifugal separating machine, H. M. Goodman.....	949,226	Folding gate, A. Bataille.....	949,739
Centrifugal separator, H. M. Goodman.....	949,227	Food, cattle, E. S. Davis, Jr.....	949,416
Centrifugal separator, H. M. Goodman.....	949,227	Food product and making the same, R. S. Summers.....	949,029
Centrifugal separator, W. P. Shepherd.....	949,003	Foot guard, R. D. Culter.....	949,649
Chair head rest, Hauch & Scheib.....	949,300	Foot handle, bay, G. Reynolds.....	949,089
Check book, J. Tschudi.....	949,009	Fountain, C. A. Dunlap.....	949,267
Chemicals, package for, C. F. Jenkins.....	949,708	Frame, display, J. A. Brown.....	949,267
Chemical composition, T. E. Murray.....	949,243	Frequency generator, variable, G. Facelli.....	949,329
Chuck, drill, J. W. Rhyne.....	949,429	Friction let off, J. Fuller.....	949,268
Cigar moisture, J. F. Herberich.....	949,430	Fruit picker's bag, E. J. Mason.....	949,024
Cigar moisture, I. C. Tetherow.....	949,006	Fuel, machine for forming artificial pressed, F. Fontana.....	949,176
Cigarette machine, E. C. Deauville.....	949,067	Fuel, treating, A. G. Manser for dynamo, W. R. Hilecox.....	949,329
Circuit closer, automatic, T. W. McKenzie.....	949,583	Funnel and measure, combined, W. R. Hilecox.....	949,074
Circuit wire covering pipes, connecting device for, T. E. Murray.....	949,243	Furnace charging apparatus, blast, R. H. Hilecox.....	949,403
Clamp form, G. B. Elliott.....	949,172	Furnace construction, S. D. Oilphant.....	949,402
Clamp strapping, E. A. Brown.....	949,218	Furnace grate bar, E. L. Thomas.....	949,639
Clamping attachment, J. Sell.....	949,332	Furniture clamping device, H. M. Holtgrewe.....	949,233
Clay ballast, device for use in producing burnt, G. M. Bennett.....	949,141	Furniture construction, H. Abel.....	949,082
Clock, E. A. Hummel.....	949,705	Fuse plug, electric, J. H. Hanson.....	949,630
Clock synchronizing apparatus, E. A. Hummel.....	949,122	Game apparatus, W. F. Schnelle.....	949,002
Clothes line hanger, safety, E. J. Eckhardt.....	949,700	Game apparatus, exercising, Taylor & Bartlett.....	949,385
Cloth mechanism, E. J. Wilson.....	949,550	Garment, belt, buttoning, J. A. Brown.....	949,007
Coke oven, apparatus for watering coke in, Affelder & Gorton.....	949,290	Garment fastener, H. I. Elson.....	949,064
Coke, shir, S. Kadmon.....	949,550	Garment, infant's, W. B. Tyrrell.....	949,164
Collar stuffing machine, horse, Collett & Bennie.....	949,293	Gas burner, J. Davis.....	949,079
Combining machine, Fringe, Pennington & Andrews.....	949,088	Gas burner, self igniting, H. Ruppert.....	949,590
Combustion regulating apparatus, G. W. Parker.....	949,586	Gas lights, manufacture of incandescent bodies for, M. von Uruh.....	949,010
Commutator for dynamo-electric machines, M. Walker.....	949,105	Gas meter, furnace, R. J. Brooke.....	949,074
Comod, J. E. Cape.....	949,158	Gas mixing and purifier, J. J. Jones.....	949,082
Composition of matter, F. A. Grandin.....	949,081	Gasket for pipe joints, F. J. Randall.....	949,658
Concrete construction, reinforced, P. W. Cook.....	949,262	Gas setting, J. J. Murrin.....	949,657
Condenser, water heater and oil separator, C. West.....	949,217	Glass, making sheets or plates of opalite or opal, J. H. Harvey.....	949,183
Conduit outlet, H. A. Gilbert.....	949,628	Glass, molding machine, W. P. Welling.....	949,380
Container and grating device, combined, C. Winlack.....	949,388	Glasses, trial frame for bifocal, F. G. Lanchard.....	949,109
Converter, variable ratio rotary, J. L. Woodbridge.....	949,251	Grader, road, J. F. Lutes.....	949,588
Coolers, coil projector for, A. C. Canada.....	949,216	Grate, metal, section, connector for, J. L. Lutes.....	949,499
Cooling and drying materials, apparatus for, W. G. Schroder.....	949,719	Grate, J. W. Fowler.....	949,065
Copper, producing electrolytic, A. S. Hamage.....	949,003	Grate bar leaf, renewable, T. S. Johnson.....	949,079
Corn shucker, R. Schell.....	949,718	Grip device, intermittent, Foud & Wagner.....	949,304
Corn clamp, A. H. Stetson.....	949,096	Grinder, portable, J. H. Murrin.....	949,065
Cornet fastener, G. Bennett.....	949,142	Hair drying device, B. Parker.....	949,713
Cornet mouthpiece, H. L. Lohrer.....	949,021	Hair waving, P. E. Hermann.....	949,272
Cotton cleaner, T. W. Felton.....	949,627	Hand rail support, porch, T. Hulett.....	949,075
Coupling, See drill coupling.....		Heater, corn, J. A. Schell.....	949,736
Crate, metal shipping, J. A. Mayer, Sr.....	949,191	Hat size reducing device, R. H. & H. D. Curtis.....	949,264
Crib attachment, A. C. Langren.....	949,389	Headlight, H. L. Schuler.....	949,503
Cross head, B. M. Aslakson.....	949,137	Heat regulator, corn, J. F. McElroy.....	949,086
Cultivator, P. Olsson.....	949,244	Heater, T. G. Palmer.....	949,042
Cultivator, H. W. Simpson.....	949,393	Heater, H. K. Moore.....	949,282
Cultivator attachment, H. Christoffersen.....	949,218	High chair, gas cart, G. E. Francis.....	949,421
Cultivator tooth, F. E. & J. S. Bradley.....	949,690	High potential switch, F. O. Hartman.....	949,182
Currency cutting or shearing machine, J. I. Colley.....	949,462	Hinge, door, H. B	



"Star" Lathes
Foot and Power
Screw Cutting
Automatic
Cross
Feed
FOR FINE, ACCURATE WORK
Send for Catalogue to
SENECA FALLS MFG. CO.
695 Water Street,
Seneca Falls, N. Y., U. S. A.

Engine and Foot Lathes
MACHINE SHOP OUTFITS, TOOLS AND
SUPPLIES. BEST MATERIALS. BEST
WORKMANSHIP. CATALOGUE FREE
SEBASTIAN LATHE CO., 120 Culvert St., Cincinnati, O.

Incorporate Your PATENTS
and BUSINESS
in ARIZONA
Laws the most liberal. Expense the least. Hold meetings, transact
business anywhere. Blankets, By-Laws and forms for making stock
full-paid for cash, property or services, free. President Standard,
FORMER SECRETARY OF ARIZONA, resident agent for
many thousand companies. Reference: Any bank in Arizona
STODDARD INCORPORATING COMPANY, Box 8000
PHOENIX, ARIZONA

Veeder Counters
to register reciprocating
movements or revolutions.
Cut full size.
Booklet Free.
VEEDER MFG. CO.
18 Sargeant St., Hartford, Conn.
Cyclometers, Odometers,
Tachometers, Counters
and Fine Countings.
Represented in Great Britain by
MARLEY & CO., Limited, 5 City
Road, Vintry, Square, London,
E. C. 3; France, by MARLEY & CO.,
Limited, 107 Avenue Parmentier,
Paris, Germany, Austria-Hungary and Scandinavian Countries by
LEWIS, LOWE & CO., Hatten-Strasse 17-20, Berlin.

SULPHIDES SEPARATION
VALUABLE DISCOVERY
E. J. Horwood, of Broken Hill, New South Wales,
Australia, has made a most successful demonstration at
the School of Mines of Bendigo, Australia, of his invention
of "method of separating sulphides ore into its constituents."
These tests have demonstrated that through the pre-
liminary digesting of sulphurized ores in a solution of
copper salts, such as bluestone, with or without the
addition of common salt, silver becomes unfloatable and
accompanies lead in a subsequent flotation process.

**THE REASON WHY THE
KREMENTZ**
Rolled Plate
Collar Buttons
Outwear all
Others
THIS DIAGRAM ILLUSTRATES
QUANTITY OF GOLD IN
IMITATION BUTTONS
THIS ILLUSTRATES QUANTITY
OF GOLD IN THE
KREMENTZ BUTTON
At all dealers. Gold and rolled plate. Insist on the
Krementz. If damaged in any way a new one free.
Story of Collar Button showing shapes and sizes free.
If dealer will not supply, we will.
Krementz & Co., 77 Chestnut St., Newark, N. J.

**THE
"BEST
LIGHT"**
EVERY one is a self-con-
tained miniature light
works. 100 to 2000 candle
power. Costs less than
kerosene.
Absolutely safe
Very brilliant
Powerful
and steady.
Every lamp warranted.
Over 800 styles.
Agents wanted. Catalog
free. Write to-day.
The Best Light Co.,
87 E. 5th St.,
Canton, O.
MAKES
AND BURNS
IT'S OWN
GAS

FRICTION DISK DRILL
FOR LIGHT WORK.
Has These Great Advantages:
The speed can be instantly changed from 10 to 1600 without
stopping or shifting belts. Power applied can be graduated
to drive, with equal safety, the smallest or largest drills
within its range—a wonderful economy in time and great
saving in drill breakage. 10¢ Send for Drill Catalogue.
W. F. & JNO. BARNES CO.,
Established 1872.
1999 Ruby Street, Rockford, Ill.

**JUST PUBLISHED
VEHICLES OF THE AIR**
By V. LOUGHEED
A Popular Exposition of Modern Aeroplanes with
Working Drawings. The most complete book published
on aerial navigation. 470 pages, 6 1/2 x 9 1/4 inches, 270 il-
lustrations, including working drawings of machines
and parts. Price \$2.75 postpaid. Send for a de-
scriptive circular.
MUNN & COMPANY, Inc., 361 Broadway, New York City

**ARITHMETIC
SELF-TAUGHT**
A plain, easily-understood volume for
all who have not had the opportu-
nity of learning this subject thor-
oughly, or who have forgotten what
they once learned.
252 Pages. Requires No Teacher.
This great little book
sent postpaid for
60 Cents
(Guaranteed, leather binding, \$1.00).
Geo. A. Zeller Book Co.
Est. 1876. 4474 W. Belle Pl., St. Louis, Mo.

**GROBET
Swiss Files**
and other tools shown
in "The Tool-Monger."
Sent free if you mention this paper when writing.
MONTGOMERY & CO., 169 Fulton Street, New York City

Iron refining furnace, Hawkins & Key	949,475
Ironing board, C. E. Call	949,466
Ironing board, electromagnetic, E. S. Clay- ton	949,351
Jack locking device, Bates & Fride	949,460
Junction box, W. J. Graham	949,429
Keg, powder, L. B. Eaton	949,395
Knife edge bearing, A. Sonander	949,004
Knit fabrics, machine for knitting, G. Keyser	949,280
Knitting machines, looping device for, J. W. Latcher	949,370
Knot tying machine, J. C. Anderson	949,408
Labeling machine, bottle, F. N. Young	949,367
Ladder, extension, H. Epstein	949,529
Ladder rungs and the like, support and brace for, F. C. Myer	949,194
Ladder, step, W. J. Blundell	949,614
Lamp, acetylene gas generating, J. Boser	949,349
Lamp, arc, J. T. H. Denoyer	949,353
Lamp circuit, vapor electric, P. H. Thomas	949,335
Lamp cleaner, electric, E. E. Edgerton	949,419
Lamp, electric arc, J. C. Lincoln	949,051
Lamp, inverted incandescent gas, G. Rapp	949,547
Lamp, metallic filament incandescent, W. Majert	949,153
Lamp, miner's, Davis & Monteith	949,318
Lamp socket, cluster, C. D. Gervin	949,535
Lamp socket, electric, B. Dezan	949,309
Lamp socket, incandescent, W. H. Perkins	949,263
Lamp socket, incandescent electric, D. E. Bowa	949,517
Lambs, match holder attachment for, W. C. Braun	949,390
Last support and last unhooking device, combined, G. G. Schelter	949,100
Lath, door, C. D. Smith	949,405
Latch for door hangers, H. C. Schaefer	949,221
Lawn sprinkler, G. H. Choate	949,520
Ledger, self indexing, A. J. Achter	949,514
Leg spreader, C. Freund	949,118
Lens holder, J. M. Chappel	949,413
Lifting, See pen-lift	
Lifting jack, multiple, A. H. Scholle	949,331
Lighting arrester, G. W. Clark	949,565
Lighting arrester, pole line, A. R. Rhein- berger	949,130
Line check, W. B. Powder	949,177
Liquid into vessels through a closed cham- ber by an adjustable nozzle, means for introducing, J. A. Hicks	949,479
Lock, S. N. Rieger	949,409
Lock, C. A. Berry	949,613
Locomotive ash pan, H. A. Hoke	949,017
Locomotive ash-pit, O. Speth	949,162
Locomotive, electric, E. F. W. Alexanderson	949,347
Loom, J. E. Goodwin	949,625
Loom dobbie, Kuttuff & Frefel	949,238
Loom rack adjustment, S. Kendrick	949,579
Loom shuttle box motion, A. A. Gordon, Jr.	949,353
Loom stop motion, P. E. Schaefer	949,565
Loom, self carrier for needle, J. P. Humphries	949,706
Lumber register, R. H. Mellowa	949,127
Magnet for dynamo electric machines, field, E. Mattman	949,082
Mail box support, H. J. Hanson	949,231
Mail marking machine, F. C. Hilde	949,275
Mantle protector and holder, G. E. Hulse	949,905
Manure spreader frame, F. Schaefer	949,601
Manure spreaders, drill attachment for, C. H. Ellis	949,173
Massage apparatus, M. A. Haines	949,230
Massage apparatus, J. Sabatino	949,550
Match box holder, H. C. Kirk, Jr.	949,185
Match case, B. Epstein	949,528
Match receptacle, cigar cutting, J. P. Croschwald	949,524
Matchsafe, J. L. Dunning	949,223
Measurement gage, outside or inside, G. E. Johannson	949,276
Measuring device, foot, J. H. White	949,289
Meat compound, preparing a preserved, B. Tuth	949,536
Meat press, E. M. Johnson	949,234
Meat slicer and cutter, combined, J. Winkel- meyer	949,544
Medical implement, M. J. Rogers	949,382
Metals from solutions, electrolytic apparatus for recovering, W. A. Hendryx	949,016
Meter testing device, H. P. Westcott	949,640
Milk and cream purifying apparatus, J. H. Curran	949,295
Mill, See Cutting mill	
Minerals, separation of combined, A. S. Ramage	949,002
Miter box, W. Turner	949,400
Mixing machine, P. H. Knecht	949,090
Mixing machine, A. J. Cropp	949,608
Mold, J. A. Rathbone	949,496
Mold filling machine, J. Anderson	949,743
Molding apparatus, J. A. Rathbone	949,497
Mop, J. D. Keener	949,679
Mosquito bar support, A. F. Chastant	949,620
Motor control, single-phase, E. F. W. Alex- anderson	949,346
Motor control, system, electric, W. Cooper	949,114
Motor control system, electric, W. Cooper	949,114
Motors and receptacles, support for, J. C. Neuschwander	949,107
Mount trimming machine, C. H. Cadieu	949,110
Musical instruments, amplifier for, W. H. G. Williams	949,250
Muzzle and calf weaner, W. H. Lyman	949,730
Nail or spike puller, G. W. Troger	949,337
Needle, C. Reynolds	949,496
Need for poultry, recording, G. A. L. Argies	949,610
Nozzle, J. G. Mastlin	949,489
Nursing attachment, H. B. Cunningham	949,414
Nut lock, H. Betz	949,412
Nut lock, Davidson & Maudslayi	949,624
Nut lock, C. D. Loehr	949,741
Oil burner, P. H. Herrif	949,073
Oil burner, Cowan & Felten	949,648
Oil burner, crude, F. D. Stafford	949,153
Oil gun, Molinari & Laurent	949,193
Open hearth furnace, S. E. Meyers	949,192
Ore sampling apparatus, A. J. McCone	949,284
Ore separator, G. W. Kunkel	949,709
Ores, reducing, C. J. Weatherly, Jr.	949,257
Oscillating motor, G. Hager	949,372
Pan, P. C. Howland	949,994
Pan and plate lifter, G. C. Degner	949,650
Pan lifter, D. O. & A. R. Henry	949,573
Paper bag machine, W. C. Fuller	949,409
Paper bottle, C. F. Jenkins	949,036
Partitions, sanitary base for, G. C. Mason	949,359
Paste tube, F. Muller	949,543
Pen, fountain, W. E. Geyer	949,425
Pencil holder, J. W. Miller	949,501
Pencil sharpener, D. L. McBride	949,055
Photographic printing frame, D. J. Lind- say	949,125
Pianos, action for pneumatic player, Berg- lund & Webb	949,612
Pilling, metal, J. J. Harold	949,473
Pin, See Dowel pin	
Pipe cleaner, G. N. Cragin	949,022
Pipe coupling, F. C. Fahner	949,329
Pipe coupling, train, H. W. Thomas	949,046
Pipe hanger, R. C. Hunter	949,076
Pipe threading tools, work holder for, B. Borden	949,631
Pipe wrench, J. F. Wren	949,107
Pipe wrench, S. A. Whetzel	949,557
Piston ring, W. A. Reinhardt	949,660
Piston guide, W. T. Whiteway	949,601
Plant stand, adjustable, J. M. Hamm	949,535
Planter seedling attachment, J. L. Baldwin	949,254
Plastic material mold, G. A. Harter	949,571
Plate or dish, child's, J. C. Matthews	949,025
Plow, J. H. Nicholas	949,492
Plow, J. G. Redmond	949,086
Plow, J. R. Rosetter	949,688
Plow harrow attachment, A. L. Luce	949,039
Plowshare, G. J. Buckley	949,617
Pneumatic cleaner, A. C. Buell	949,570
Pocket guard, A. J. Bellah	949,045
Polish device, B. M. Schuman	949,073
Powder and other substances, instrument for administering, L. J. F. Nicolai	949,302
Power transmission device, G. A. Carter	949,263
Pressure gage, differentiating, E. B. P. Roberts	949,508
Primary battery, W. C. Banks	949,230
Printing machine sheet feeding device, G. Kleim, re-issue	13,082

The Car That Captured The Country

The Overland—as some of you know—is the greatest sensation in motordom. In two years the demand has grown from almost nothing to 20,000 cars—our orders for the present year. All without advertising—solely because there was never a car that compared with the Overland.

An Enticing Story

Every man should know of the Overland. For here is a story of quick success such as never before has been written.

A story of a man—Mr. John N. Willys—who took a bankrupt concern whose only asset was a car created by a mechanical genius. And, because of this wonderful car built the sales in two years to a monthly sale exceeding \$2,000,000.

How he operates four factories—employs 4,000 men—ships 30 carloads of automobiles per day—to supply the call for Overlands.

You don't know the best about motor cars until you know the car which—in two years' time—has captured a large share of the whole trade of the country.

Simplicity

The key to the Overland's astounding success has been largely simplicity. For the early Overlands—when the output was small—were not such bargains as now.

A ten-year old child in five minutes can master an Overland car. It is all done by pedal control. An amateur can run one—the first time he tries it—from Chicago to the Pacific.

Never was a car so simple, so staunch, so easy to keep in order. And never was a car—within range of the price—so large, so attractive, so powerful.

One Overland car has, again and again, sold from 15 to 30 others. The 4,000 Overlands sold last year brought us orders for this year—before the year opened—for 20,000 cars.

Cost Cut 20 Per Cent

This tremendous production has cut the cost of Overlands 20 per cent. Overland Model 38 sells for \$1,000 now. It is considerably better than the \$1,250 Overland last year. Power, 25 horsepower—speed, 50 miles an hour.

A 40 horsepower Overland this year sells for \$1,250. And for \$1,500—in the Overland—one gets the equal of any \$3,000 car.

No other maker attempts to give what the Overland gives for the money. For no other maker turns out daily—as we do—125 standardized cars.

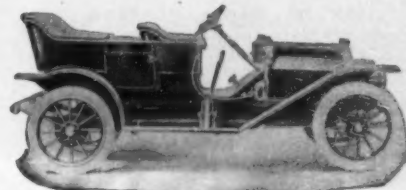
And the price of each Overland includes lamps and magneto—a car all ready to run.

Get the Whole Story

All this wonderful story is told in a book. Send me this coupon for it. You can't know the best about automobiles until you know this remarkable car.

F. A. BARKER, Sales Manager,
THE WILLYS-OVERLAND COMPANY,
TOLEDO, OHIO
Licensed Under Federal Patent.
Please send me the book.

The
Overland
Made in
Six Styles of Body



"CASTELL"
DRAWING, COPYING AND INK PENCILS
are the finest productions of a house that has been manufacturing the highest grade lead pencils for 149 years and has earned a reputation for excellence that has
A. W. FABER
famous all the world over. Sold by all stationers and dealers in artists' and drawing materials. Single will be sent you on receipt of five.
A. W. FABER, 49 Dickerson Street, Newark, New Jersey

A HANDY LITTLE TOOL
is our Rule Clamp No. 29 used to clamp two steel rules together—clad to end—in extension. Rules may be of same or different widths up to 14 inches. Of special value to mechanics having tool chests smaller than 12 inches.
Price 50c. a pair
Send for 222 page catalog No. 15-B.
THE L. S. STARKETT CO., Athol, Mass., U. S. A.

SENSITIVE LABORATORY BALANCE
By N. Monroe Hopkins. This "built-up" laboratory balance will weigh up to one pound and will turn with a quarter of a postage stamp. The balance can be made by any amateur skilled in the use of tools, and it will work as well as a \$125 balance. The article is accompanied by detailed working drawings showing various stages of the work. This article is contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 1184. Price 10 cents. For sale by MUNN & CO., Inc., 201 Broadway, New York City or any bookseller or newsdealer.

Don't Throw It Away
Does Your Granite Sink or Hot Water Sink?
USE **MENDETS**
They mend all leaks in all utensils—tin, brass, copper, graniteware, hot water bags, etc. No solder, cement or rivet. Anyone can use them; it's a surface; two million in use. Send for sample pkg. 30c. Complete pkg. assorted sizes, 25c. postpaid. Agents wanted. Collette Mfg. Co., Box 192, Amsterdam, N. Y.



Special Easter Cruise LEAVING THURSDAY, MARCH 24TH

Could Any Trip Be Better Chosen
Than to BERMUDA, ST. THOMAS,
SAN JUAN and HAVANA?

Returning Saturday, April 9th. Two weeks of delightful travel on the superb twin screw steamship MOLTKE (12,500 tons), with all modern safety appliances and comforts of a first-class hotel. Ample Time Ashore for Sightseeing. \$85.00 up.

Also Summer Cruises to Norway, Spitzbergen, Iceland, Etc.

WRITE FOR TRAVEL BOOKS

Hamburg-American Line, 41-45
Boston Philadelphia Chicago St. Louis San Francisco

Door and Window Screens

Made of

POMPEIIAN
BRONZE
WIRE CLOTHare the kind that last, look
better and are better than the
painted or galvanized kind.

(Trade Mark)



No matter where
you live in the summer
—seaside—lowlands—
mountains—country or city,
use POMPEIIAN BRONZE
for your screens, because:

It is Weather-Proof—Climate-Proof
—Rust-Proof and Wear-Proof

POMPEIIAN BRONZE WIRE is not
painted or coated. It is made of an alloy
containing over 90% pure copper. This
means that, unlike ordinary wire, it cannot
corrode and will last forever.

POMPEIIAN BRONZE IS NOT
EXPENSIVE

Ask your dealer for POMPEIIAN
BRONZE. Specify and insist on it for
all the screens you order. All sizes of mesh,
all weights. Most Hardware Dealers have
it. If yours hasn't, don't take any other.
Write our nearest branch. We'll supply you
direct and guarantee a satisfactory purchase.

CLINTON WIRE CLOTH CO.

Factory, CLINTON, MASS.
BOSTON NEW YORK CHICAGO SAN FRANCISCO

\$1.00 AN HOUR

"Keech" makes this and more. "Keech"
is the great razor sharpener, the only one
that will hone or strip. L. A. Finkler
makes \$4.00 to \$10.00 a week selling it.
Write today. KEENHOL CO. 4426 Keenhol Bldg. Detroit, Mich.

NOVELTIES & PATENTED ARTICLES

MANUFACTURED BY CONTRACT, PUNCHING, DIE, SPECIAL MACHINERY,
E. KONIGSLOW STAMPING & TOOL WORKS, CLEVELAND, O.

DRYING MACHINES

For Granular Material
S. E. WORRELL
Hannibal, Mo., U. S. A.

PRINT
Your
Own

Cards, circulars, book, news-
paper, press, etc. Save money. Print
for others, big profit. All easy,
rules sent. Write factory for
press, outfit, TYPE, paper, etc.
THE PRESS CO., Meriden, Conn.

THE ECONOMICS OF
RAILWAY TRANSPORT

By SYDNEY CHARLES WILLIAMS, B.A.
Secretary to the Agent East Indian Railway

Crown 8vo, \$1.25 Net. Postpaid, \$1.35
THE MACMILLAN CO., New York

Aeroplanes and Motors

We are building monoplane of the Bleriot cross-
channel type. Delivery 3 weeks after receipt of order.
Flight guaranteed. Price \$5,000; one-third cash with
order.
We also build several kinds of light-weight aeroplanes
and propellers. Particulars and prices furnished
upon application.
SCIENTIFIC AEROPLANE AND AIRSHIP CO.
Box 773, New York

WELL DRILLING
MACHINES

Over 70 sizes and styles, for drilling either deep or
shallow wells in any kind of soil or rock. Mounted on
wheels or on rails. With engines or horse power.
Strong, simple and durable. Any mechanic can operate
them easily. Send for catalog.

WILLIAMS BROS., Ithaca, N. Y.

HOW TO MAKE AN ELECTRICAL

Furnace for Amateur's Use.—The utilization of 110-volt
electric circuits for small furnace work. By N. Monroe
Hopkins. This valuable article is accompanied by
detailed working drawings on a large scale, and the fur-
nace can be made by any amateur who is versed in the
use of tools. This article is contained in SCIENTIFIC
AMERICAN SUPPLEMENT No. 1194. Price 10 cents.
For sale by MUNN & CO., Inc., 361 Broadway, New York
City, or by any bookseller or newsdealer.

Sterilizing apparatus, A. Richter.....	949,061
Stone-planing planer, L. Crane.....	949,315
Stone-sawing machine, L. Crane.....	949,317
Stove, F. M. Beverly.....	949,086
Straw and chaff separator and stacker, H. P. Mohr.....	949,301
Street or station indicator, H. F. Magone.....	949,307
Street sweeper, O. Grimwood.....	949,009
Stud-bearing, Buetner & Shetburne.....	948,987
Superphosphates from the decomposition chamber, apparatus for removing, K. J. Beskow.....	949,005
Supporter, A. Queuser.....	949,716
Supporter, F. C. Ferrell.....	949,728
Surface finishing machine, S. T. Johnson.....	949,037
Switch stand and lock, J. W. Torpey.....	949,098
Syringe, vaginal, O. Katsenberger.....	949,539
Table, See Billard table.....	
Tachometer and odometer, N. M. Hopkins.....	949,740
Tag fanster, J. C. Harris.....	949,570
Tag, seal price, H. V. Shaw.....	949,201
Tally board, H. B. Patriarche.....	949,379
Tee and coffee saver, E. F. Corbett.....	949,523
Teat cup, D. Klein.....	949,186
Telegraphy, space, S. Cabot.....	949,518
Telephone line, multiple station, A. J. Farmer.....	949,530
Telephone selecting system, D. W. Jones.....	949,235
Telephone system, H. G. Webster.....	949,012
Telephone systems, selecting apparatus for, Nicholas & Rich.....	949,378
Telephones, means for attaching tele- phone control mechanism to, W. H. Thompson.....	949,090
Tension controlling device, S. W. Wardwell.....	949,407
Thill strap fastener, H. C. Petzer.....	949,175
Threshing machine, B. A. Amble.....	949,049
Tie clasp, A. M. Banta.....	949,516
Tile cutting machine, A. S. Janin.....	949,035
Time recorder, W. D. Hawley.....	949,282
Tire for vehicle wheels, resilient, J. H. Rawlins.....	949,684
Tire pneumatic, W. M. Harley.....	949,472
Tire protector, E. F. Hayes.....	949,572
Tire, resilient, E. B. Merigouin.....	949,001
Tire tightener, G. A. Ryan.....	949,663
Tire tool, S. Alley.....	949,551
Tire, vehicle, W. J. Courtney.....	949,000
Tire, vehicle, W. A. Konekman.....	949,375
Tires and forming same, reinforcement for pneumatic, C. F. Murray.....	949,150
Tires, etc., vulcanizer for repairing rubber, V. H. Meyer.....	949,154
Tobacco, moistening, Fette & A. Yonke.....	949,701
Toilet seat attachment, O. A. Berger.....	949,562
Tongs for forming tube joints, band, S. A. Bergh.....	949,411
Tool, C. Westrom.....	949,030
Tool chest, portable metallic, B. A. Bus- sell.....	949,502
Tool, pneumatic, W. H. Keller.....	949,080
Tool post, C. A. Johnson.....	949,078
Torpedo launching apparatus, S. Lake.....	949,525
Tor, W. L. Loyd.....	949,152
Tor, A. O. Moehlestein.....	949,544
Tor airship, G. English.....	949,420
Tor, sounding, A. H. F. Schlicker.....	949,551
Tractor engine, W. Runyon.....	949,350
Train stop, automatic, K. W. Carlgren.....	949,145
Transformer case construction, L. C. Nichols.....	949,086
Transmission system, O. T. Lademan.....	949,187
Travelers, device for dispensing, J. S. Drake.....	949,626
Tree, See Saddle tree.....	
Trestle, G. A. Mitholland.....	949,242
Truck for agricultural machines, supporting, G. G. Helmke.....	949,071
Truck for manure loading, H. Schodenhorn.....	949,202
Trucks, spring plank for car, J. H. Baker.....	949,292
Trucks, sliding log for, R. C. Bain.....	949,459
Truss, F. Makepeace.....	949,543
Tub, See Bath tub.....	
Tube cleaner, motor, H. S. Stormer.....	949,639
Tube cutter and expander, F. M. Ashley.....	949,136
Turbine, elastic fluid, Richardson & West.....	949,440
Turastile, W. E. Stratton.....	949,384
Type writing machine, G. A. Bell.....	949,008
Type writing machine, O. Woodward.....	949,103
Type writing machine, B. Dysart.....	949,224
Type writing machine, E. E. Barney.....	949,237
Type writing machine, J. E. Tomblin.....	949,463
Type writing machine, R. S. Vallant.....	949,508
Type writing machine, A. A. Yonke.....	949,720
Type writing machine, W. E. Barnard.....	949,725
Umbrella, folding, J. & F. P. Solomon.....	949,554
Universal coupling, H. Lentz.....	949,180
Valve, C. P. Brand.....	949,056
Valve, C. E. Dacey.....	949,115
Valve, T. Andrews.....	949,168
Valve, C. R. Ballard.....	949,208
Valve, J. Rothchild.....	949,635
Valve, W. S. Brown.....	949,097
Valve, clack or flap, M. F. Gutermuth.....	949,070
Valve mechanism, J. Rowbotham.....	949,734
Valve, regulating, G. W. Collins.....	949,294
Valve reseating device, G. H. & H. W. Brown.....	949,057
Vapor mantle burner, C. M. Langren.....	949,060
Vase, A. W. Smith, Jr.....	949,452
Vehicle brake, H. E. Penney.....	949,246
Vehicle brake, Hotchkiss & Lane.....	949,652
Vehicle dump bed, D. W. Carr.....	949,313
Vehicle dumping body, D. W. Carr.....	949,314
Vehicle, motor, W. C. Price.....	949,158
Vehicle spring, D. R. Close.....	949,112
Vehicle spring, Smith & Kline.....	949,308
Vehicle wheel, J. C. Rutherford.....	949,636
Vehicles, appliance for preventing side slip- ping of wheels on motor, Mansell & Smith.....	949,190
Vehicles, hand steering wheel for motor, G. Frentzen.....	949,297
Ventilating shaft top, Rawling & White.....	949,693
Ventilating system, P. B. Bogart.....	949,212
Ventilator, G. Kabureck.....	949,482
Ventilator, C. H. Mason.....	949,632
Vessel filling machines, locking mechanism for, J. M. Hicks.....	949,476
Vulcanizing press, A. H. Harris.....	949,428
Wafer machine, D. Fabian.....	949,371
Wagon heater, W. B. Milligan.....	949,590
Wall, Bauminger & Shaffer.....	949,527
Wall mold, E. W. Collins.....	949,521
Wardrobe, portable, J. Leininger.....	949,583
Water boiler attachment, W. H. Rich.....	949,087
Water holding case, W. E. Porter.....	949,364
Water closet seat, H. S. Rumsey.....	949,199
Water heating apparatus, D. N. Gibson.....	949,298
Water motor, H. C. Phillips.....	949,715
Water tanks, automatic regulating device for, W. L. Brubaker.....	949,616
Weed cutter, M. Prunz.....	949,597
Welded fabric, C. Swincoe.....	949,068
Wells, cleaning oil, F. A. Flanagin.....	949,567
Wheel, See Vehicle wheel.....	
Wheel, M. Lachman.....	949,907
Whiffletree, L. E. Feinstein.....	949,174
Whiffletree hook, W. M. Wadleigh.....	949,556
Windmill, J. P. Wyndham.....	949,512
Wind motor, D. D. McIntyre.....	949,027
Winding frames, measuring and thread cut- ting device for, M. Ebeling, Jr.....	949,171
Window, G. Moehne.....	949,574
Wire connector, ground, F. E. McKinnon.....	949,743
Wire stretcher, J. Wright.....	949,458
Wrench, F. Moenber.....	949,083
Wrench, C. A. & E. Rayman.....	949,085
Wrench for screwing flanges or sockets on pipes, M. McLane.....	949,711
Wrench handle, pipe, A. L. Moore.....	949,731
Wringer roll, E. Bruegel.....	949,564

Reliable Powers for

Contractors, shop
work, inventors,
mechanics and all
lines of small
manufacture.

I. H. C. Gasoline
Engines

Built on strong simple lines. Typical engines for
efficient service. Vertical. Horizontal (Portable
and Stationary). Skidded and Mounting Engines
and Gasoline Tractors. Water-cooled and Air-
cooled. Sizes from 1 to 25-horse-power. For cata-
logue and all information address

INTERNATIONAL HARVESTER CO. OF AMERICA
(Incorporated)
15 Harvester Bldg., Chicago, U. S. A.

GRAY MOTORS

6 HORSE POWER COMPLETE \$94
1,283 Cylinders, 3 to 30 H.P.
Write for complete catalog today with all about these high grade
engines we built in the largest plant in the world devoted
exclusively to the manufacture of 2 cycle motors.
GRAY MOTOR CO., 11 LEIS ST., DETROIT, MICH.

Palmer Motors and Launches

Two and Four Cycle. One, Two and Four
Cylinder. Stationary and Marine. One to
Twenty H. P. Catalogue FREE.

PALMER BROS., Cos Cob, Conn.
New York: 20 E. 50th St., Philadelphia: The Broom
Building 50 Union St., Providence, R. I.: 92 Eddy St.
Portland, Me.: Portland Pier.
Seattle, Wash.: 400 First Ave. So.
Vancouver, B. C.: 1400 Powell St.

Kerosene Oil Engines

Marine, Stationary, Portable
NO DANGER. Maximum Pow-
er. Lightest weight. Simple. Reli-
able. Economical. No Batteries.
Self Ignition by Compression.
Fully guaranteed. Write for Cata-
logue S. A. No charge for
packing.

AMERICAN OIL ENGINE CO.
1775 BROADWAY, NEW YORK, U. S. A.

WANTED—One fourth-class ship draftsman at \$3.00
per diem and one first-class assistant ship draftsman at
\$3.25 per diem. A competitive examination will be held
March 3, 1910, to fill the above positions. For further
information, "Superintending Constructors,"
U. S. N. Newport News Shipbuilding and Dry Dock
Company, Newport News, Va.

ICE MACHINES

Carline Engines, Brewers
and Bottlers Machinery, I. H. VILIER
MFG. CO., 300 Clinton St., Milwaukee, Wis.

MODELS & EXPERIMENTAL WORK.

Inventions developed. Special Machinery.
E. V. BAILLARD CO., 24 Franklin Street, New York.

CONSULTING ENGINEER.

ERNEST L. HANNOKE
Reinforced Concrete
11 Broadway, New York

RUBBER

Expert Manufacturers
Fine Jobbing Work
PARKER, STEARNS & CO., 284-290 Sheffield Av., B'klyn, N. Y.

SOUTHERN STAMPING & MFG. CO.

Manufacturers of special and patented articles.
R. S., Nashville, Tenn.

MOORE

Builders of Special Machinery to Order.
Inventions perfected. Models
Building and Repairing Steam, Chicago, Ill., U. S. A.

HOEFT & COMPANY

Die Makers, Metal Makers, Machinery Builders, Punch Presses
Light and Heavy Stampings. Michigan St., Chicago, Ill., U. S. A.

THE BEST EQUIPPED SHOP

For Mechanical and Electrical Manufacturing
Special Machinery, Jigs, Tools,
Repairs, Experimental Devices

Designing and Commercializing a Specialty
THE ROWLAND TELEGRAPHIC COMPANY, Baltimore, Md.

BABBITT METALS.—SIX IMPORTANT

formulas. SCIENTIFIC AMERICAN SUPPLEMENT 1123.
Price 10 cents. For sale by Munn & Co., Inc., and all
newsdealers. Send for catalogue.

Learn Watchmaking

We teach it thoroughly in as many months as it
formerly took years. Does away with tedious appren-
ticeship. Money earned while studying. Positions se-
cured. Easy terms. Send for catalogue.

ST. LOUIS WATCHMAKING SCHOOL, St. Louis, Mo.

Free Catalogue of
Scientific and
Technical Books Free

We have just issued a new edition
of our Catalogue of Scientific and
Technical Books, which contains
144 pages, and a copy will be mailed
free to any address on application.

MUNN & CO., Inc., Publishers of Scientific American
361 Broadway, New York

Pennsylvania R. R.

REMINDER BULLETIN

A Boon to the Busy Man

The use of the most modern type
of speed-making locomotives, coupled
up to the best type of equipment
and guided by the most vigilant man-
agement makes railroad travel secure
and prompt.

The time of a busy man is one
of his assets. It means either gain or
loss to him.

The certainty of figuring his time
in transit to the exact hour relieves
his engagement list from entanglement.

The telephone may make the en-
gagement, the train will keep it.

The Pennsylvania Special fol-
lows up the telephone message. It
brings the two ends of the wire
together and consummates the meet-
ing between working hours.

The man with business connec-
tions in New York and Chicago can
lose no time by traveling on the
Pennsylvania Special. It runs
while the desks are closed.

Pennsylvania Special (18 hours
between New York and Chicago)
leaves New York 3:55 p. m. Down-
town Tube 4:05 p. m. and arrives
Chicago 8:55 a. m.

Over five hours for business to
2:45 p. m. when it leaves Chicago
for the East and arrives in New York
next morning (Breakfast on the train)
at 9:45 a. m.

PULL THE CHAIN AND
TURN ON THE SUNLIGHT

Helios Light is better than electricity
or city gas, cheaper than kerosene
or candles. Steady white, brilliant; costs
4c per hour. Burns 97% air. Lighted or ex-
tinguished by pull of chain. No smoke, no
soot, no odor, no grease, no wicks to trim.

Helios Light

Absolutely Safe
For homes, stores, halls, factories, shops,
churches, hotels, public buildings, streets.
Delivered ready to install. Anyone can do
it. Write now for Free Booklet and make
selection from our numerous artistic styles.
Exclusive Territory and Big Money
For Good Agents. We Help You Sell.
The Standard Helios Light Company
250 Michigan Street, Chicago, U. S. A.
Established 1895, Paid-Up Capital \$100,000.00

Delight the Young and Old

Earn everybody's praise
and good will, and they
will PAY YOU WELL
FOR DOING IT IF YOU
provide them with the
amusement that can be
afforded at parks, fairs, ex-
hibition grounds, and other
public occasions by op-
erating our fascinating and money-drawing

AMUSEMENT OUTFITS

including carousels, steam and electric riding gal-
leries, merry-go-rounds, park swings, ocean waves,
razzle-dazzles, etc.

HERSCHELL-SPILLMAN COMPANY

67 Sweeney Street, North Tonawanda, New York

ISOLATED PLANT

FOR
Private Power
AND
Light Plants

Send for Sample Copy
45 W. 34th Street
New York City

The Ball Transmission

FOR
Automobiles & Motor Boats

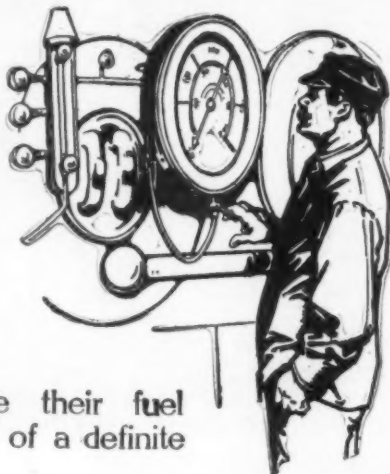
NEW YORK, SEAN WORKS

1127 10th Ave., New York City

Are You Getting A Dollar's Worth of Steam from Every Dollar's Worth of Coal?

Coal is but a means to an end, and that end is the running of a mill, a locomotive, a steamship, a dynamo. It is most important, because here the first loss so frequently creeps in.

Users of steam coal should purchase their fuel supply so that they are assured beforehand of a definite amount of steam-raising power.



PARDEE BITUMINOUS COAL

a high grade of Bituminous Coal for steam purposes, is all taken from the same basin in Cambria County, Pennsylvania. Its heat units are practically constant. The shipments run uniform—and just what PARDEE COAL will do under the boiler is known.

There's a dollar's worth of steam in every dollar's worth of PARDEE COAL. Ash and sulphur are at

the minimum. That is why PARDEE COAL earns a premium for its high steaming qualities from large users.

That is why PARDEE COAL is the most economical. If you use but a dozen tons or many thousands per month, it will pay you to investigate. The services of our mechanical engineer or chemist are at your disposal without charge.

PENNSYLVANIA COAL & COKE COMPANY

T. H. WATKINS, Receiver

WHITEHALL BUILDING, NEW YORK

Boston, 141 Milk Street

Syracuse, Union Building

Philadelphia, Land Title Building

Polar Water Stills

ALL CAPACITIES



For colleges, clubs, hotels, hospitals, laboratories, factories, bottlers, or the home; wherever a chemically pure, palatable water is essential or desired. Automatic, economical and dependable apparatus. Cities of 5,000 population and over will support a Distilled Water Business. Invest small. Profits large. Season all year. Investigate. Send for Booklet.

POLAR ICE MACHINE CO.
83 E. Jackson Boulevard
CHICAGO

Papers Held Firmly Together

"TWIN GRIP" Paper Fasteners

for the busy man's papers. The double prong hold top, bottom and middle sheets with equal safety and firmness.

Small, Smooth, Strong
Samples free on request
The De Lang Hook & Eye Co.
Philadelphia



The WONDERFUL NEW POST CARD PROJECTOR

For showing on the screen Post Cards, Engravings, Photographs and Book Illustrations, in natural colors. This New Projector is built in a thoroughly scientific manner, and while low in price is marvellously effective. With it a collection of post cards becomes a constant source of amusement and instruction in the home, the lodge or the schoolroom.

Prices—\$4.50, \$13.50, \$23.00

Send for list of our projectors, Magic Lanterns and Slides
Williams, Brown & Earle, Dept. 6, 918 Chestnut St., Philadelphia



Bristol's Recording Thermometers

For all Commercial Ranges of temperature up to 800° F. Write for new Bulletin No. 111, showing specimen records of Food Water Temperatures.

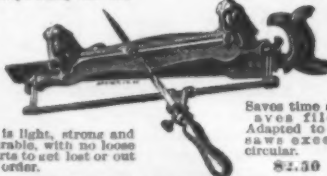
The Bristol Company
WATERBURY, CONN.

LEARN TO BE A WATCHMAKER

Bradley Polytechnical Institute
Historical Department
Peoria, Illinois
Formerly Peoria Polytechnical Inst.
Largest and Best Watch School in America
We teach Watch Work, Jewelry, Engraving, Clock Work, Optics. Tuition reasonable. Board and room near school at moderate rates. Send for Catalogue of Information.

The Elkins Saw Filer and Clamp

is a useful Tool in every carpenter's shop. It holds and files a saw to perfection, is complete in itself, always ready for use.



It is light, strong and durable, with no loose parts to get lost or out of order.

A. J. WILKINSON & CO. MACHINERY & TOOLS
184-188 Washington St., Boston, Mass.

WE WILL MAKE your models and give you estimates on manufacture of any metal novelty. Automatic machinery, tools, dies and expert work our specialty. AUTOMATIC HOOK & EYE CO., Hoboken, N. J.

PARIS GARTERS

TRADE MARK REGISTERED
For Every Climate and all the Time



Be sure you get this Box

At your dealer's \$20, \$30, and \$1.00 per pair

A. STEIN & CO. 514 Center Avenue, Chicago

NO METAL CAN TOUCH YOU

Crescent Wood Working Machinery

Gives satisfaction—Thousands in daily use.

Band Saws, Saw Tables, Jointers, Shapers, Barers, Swing Saws, Disk Grinders, Planers, Flouters and Slaters, Band Saw Sides.
Catalogue mailed on application.
The Crescent Machine Co., 280 Main Street, Lookout, Ohio, U. S. A.

CRYSTAL Domino SUGAR

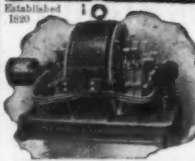
2 lb AND 5 lb

Sealed Boxes!

Best Sugar for Tea and Coffee!

By Grocers Everywhere!

COLD GALVANIZING. AMERICAN PROCESS. SAMPLES AND INFORMATION ON APPLICATION



Established 1891

NICKEL

Electro-Plating

Apparatus and Material

THE HANSEN & VAN WINKLE CO.

NEWARK, N. J.

109 N. Canal St., Chicago, Ill.



WE SHIP ON APPROVAL

without a cent deposit, repay the freight and allow 10 DAYS FREE TRIAL.

IT ONLY COSTS one cent to learn our unmatchable prices and marvelous offers on highest grade 1910 model bicycles.

FACTORY PRICES Do not buy a pair of tires from anyone at any price until you write for our large Art Catalog and learn our wonderful propositions on best sample bicycle going to your town.

RIDER AGENTS everywhere are making big money exhibiting and selling our bicycles.

We sell cheaper than any other factory.

Tires, Coaster-Brake rear wheels, fenders, repairs and all accessories at half retail prices.

Do Not Wait; write today for our special offer.

MEAD CYCLE CO., Dept. 3175 CHICAGO

Remoh Gems

Looks like a diamond—wears like a diamond—brilliance guaranteed forever—stands filing like a diamond—stands heat like a diamond—has no paste, foil or artificial backing. 1/20th the cost of diamonds. Set only in solid gold mountings. A marvelously reconstructed gem, not an imitation. Send on approval. Write for our catalog. It's free. No canvassers wanted.

REMOH JEWELRY CO., 458 N. Broadway, St. Louis

PHOTOGRAPHY HOW TO SUCCEED

THE 'WELCOME' PHOTOGRAPHIC EXPOSURE RECORD AND DIARY, 1910
Complete Instructor, Pocket Encyclopedia and Exposure Calculator. Teams with Information
All Dealers & Bookstores 50c. Helpful Booklet mailed free
BURROUGHS WELLCOME & CO., 45 LAFAETTE ST., N.Y. CITY

LUFKIN

TAPES AND RULES ARE THE BEST.
For sale everywhere. Send for Catalog No. 16.
LUFKIN RULE CO.
Saginaw, Mich., U. S. A.
New York and London.

HELMET OIL LUBRICATES ANYTHING SEND FOR SAMPLE FREE
CH. BESLY & CO. PHILADELPHIA